Interest and limits of quality of life indicators: the example of the city of Curitiba, Brazil

*Paulo Henrique Battaglin Machado**

The Issue of Quality of Life

Who perceives quality of life best? Those who experience it or those who observe it? Possibly a combination of the two, provided aspects of both human and urban space merge into a fresh concept of humane and sustainable development. To conceptualize quality of life has become a continuous challenge. To measure it, an even more pretentious task[1]. The complexity of carrying out a conceptual analysis of the quality of life of a city and its citizens is, in itself, a difficulty. The topic leads to a qualitative contemplation of both individual and collective conditions of life. According to *DEMO (1995)*, quality is of a more cultural nature than technological; artistic more than productive; playful more than efficient; wise, more than scientific. It has to do with the rather fleeting but vital sphere of happiness. One cannot be happy outside the realm of having, but being is more important. Having a gold mine is not what should make us happy, but rather the conquering of our own potential, our self-determination capacity, the realm of creation. It is the exercise of political competence". Adding quality to life, Ruffino-Neto (1992), quoting Minayo, says that Quality of life means to view man at the same time as a biological and a social being in his own society and to analyze material conditions, the primary and fundamental conditions of human life; material production forces and changes in material conditions; the mode of production of global and regional structures (economical, legal,

* IBPEX - Instituto Brasileiro de Pós-Graduação e Extensão. Rua Clara Vendramini, 58 – Mossunguê. CEP : 81.200-170 Curitiba – Pr, Brésil

1. It is not the intention of this paper to present finished methods for measuring life conditions or to suggest their adoption. Rather, this paper's aim is to provide a critical consideration of the methods currently used, their scope, and limitations. Most of all, it intends to demonstrate that no single method, or several juxtaposed ones, are capable of analyzing the quality of life of a city. What matters most is the stance adopted vis-à-vis the object under investigation. Integrity of results obtained through each method will not be discussed, as they are not within the scope of this paper.

political, and ideological) and of the social fabric (division of labor, development of productive forces, social relations of production, basic social classes, and class struggle), forms of production, circulation and consumption of goods, population, migrations, the State, the development of civil society, national and international trade relations and production, and domination, forms of real consistency, and way of life.

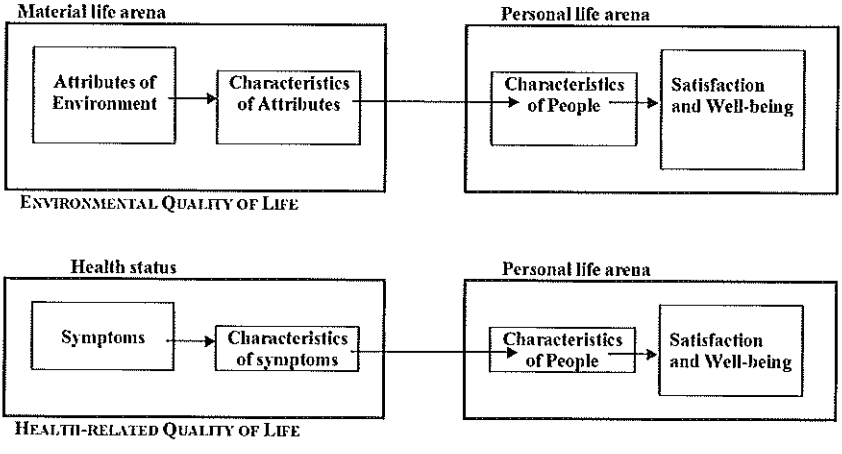
This understanding, in full compliance with the concept of health provided under the 1990 Brazilian Organic Health Act, based on the social determinants of life conditions, is extended to include the perception of social actors in the concept. Thus, in order to measure quality of life, two questions must be investigated: does the way the population perceive quality of life takes preference over the analyses carried out by those who observe it? Or is it the other way around, since perception can only be conceived from scenarios constructed and consolidated in the collective imagination? In both approaches, quality of life leads to the processes that structure life, in the city or countryside. Dowbor (1996) explains that, in essence, quality of life depends on social organization, because life in the city is more political, and the forms of management, materialized in concrete institutions and in a management culture, become imperative.

These aspects imply changes in social practices, in the actors involved, and in the social organization (Jacobi, 1996). Changes, in the contemporary context, require dialogue processes in order to reach quality of life and to increment the social capital of citizens. This leads to goals to be attained: a safe ecosystem, fulfillment of basic needs of all citizens, a gubernatorial order based on social solidarity, a holistic view of problems, and the reduction of social inequities (Mendes, 1999). This view is grasped within degrees and ways whereby the individual and the social group perceive their surroundings, resulting from a judgment made on their living environment. In this judgment, the environment takes on a new dimension, which integrates both occupied and unoccupied land in addition to other elements that contribute to provide quality (Silva, Melão, 1991).

These perspectives extrapolate the dichotomy of who observes quality of life best, wherever it constitutes the focus of all social actors in a given a community. Bley, Vernazza-Licht, (1997) point out that a multiplicity use of the term has been employed. However, even within the concept of quality of life, categories are constructed based on the focus that one wants to appropriate. Rogerson (1995) developed two conceptual models regarding quality of life: one related to health and its recovery, and another one related to environmental issues. The first approach, more common in English-speaking countries, involves the survival process or the post-illness experienced by individuals after

recovering their health. It is the state of recovery after a disease or adversity experienced as quality of life, that is, how much can be seized from life, even in adverse conditions. The second approach is more directly related to the environment, understood as the reflection of the multifaceted reality of a given social group, with emphasis on the distortions of this environment in how it faces its inequities. As to the environment proper, the model includes more encompassing concepts, where environment results from socio-economic issues from a certain reality. In this process, quality of life identifies behavioral aspects (i.e., exercise and nourishment) and the way the community perceives quality of life, from its own standpoint. The conceptual model (Figure 1) presents these two perspectives and explains the features of quality of life regarding health and the environment. However, such a model does not explore the causal relationship among the determinants of quality of life for an entire population nor deals with the discussion of indicators.

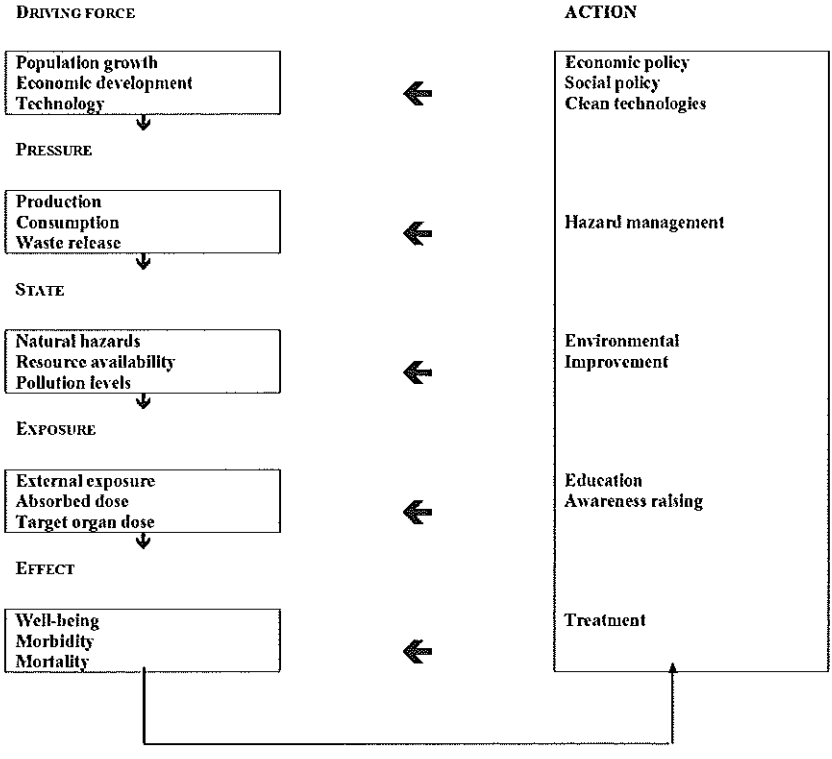
Figure 1 – *Quality of Life: Health and Environment.*



Source: Rogerson (1995)

The *Force-Pressure-State-Exposure-Effect* model (Figure 2), organized by the World Health Organization (Briggs *et al.*, WHO, 1996), tries to focus on the two trends mentioned above, presented through the integration of health and the environment in a cause-effect web. This model allows us to identify indicators that explain conditions of development in any given area, regardless of its homogeneity. It points to the analysis of more evaluative than conceptual aspects of quality of life.

Figure 2 – *Force-Pressure-State-Exposure-Effect conceptual model for the development of environmental health indicators.*



Source: Briggs *et alii*, WHO, 1996

It doesn't matter how much each model labels quality of life. Its observation attempts to comprehend everything that life can offer, provided these observations do not imply too many reductions, such as those inherent to health and environmental issues: naturalistic/biologic and socio-cultural (Porto, 1998). It is necessary to have an encompassing view, since quality of life is comprised of different aspects, much like human beings, and the methodologies used for measuring its components.

Measuring quality of life: how much can be measured?

Other models for evaluating quality were developed, as of the mid-nineties, in which each scenario is constructed according to its technical identity (economic, social, and environmental determinants, among others) (Battaglin Machado, 1996). Some other experiences have been made in order to evaluate life condition or quality of life such as the Human Development Index (HDI) (IPEA, 1998), Urban Quality of Life

Indicators (IQVU, 1998), WHOQOL-100, World Health Organization Quality of life (Fleck, 2000), QALY, quality-adjusted life-years and DALY, disability-adjusted life-years (Minayo *et al.* 2000) among others (Hammond, 1995; Gouzee *et al*, 1995).

These models will not be discussed in this paper, however, a reflection on conceptual aspects of quality of life is pertinent.

In order to reach the desired quality of life, it is necessary to devise new development models, which decentralize the decision-making power to the local level, to the community. This implies understanding of local issues, production of knowledge, integrated multidisciplinary approach, inter-sectorial information, and solutions applied to local context. The counterpoint: the city defines itself as a function of the actual needs of its inhabitants and no longer in terms of functions. Akerman (1998), on drawing an analogy with a three-dimensional image, says that the original figures are the various sectors of a city and the three-dimensional image is the « quality of urban life » which would transcend the various sectors that comprise it. In equating this three-dimensional image, « quality of urban life » would then contain the trans-sectional pact.

Monitoring quality of life is similar to following-up the improvement in redistributing and enjoying the social and technological wealth earned by a given human group (Akerman, 1996). It means to understand the human space, where there are inequalities subject to intervention. That is, according to Mendes (1999), to reduce inequities through positive discrimination of the social groups excluded, to increase the technical efficacy of public policies through inter-sectorial action, and to enhance democracy, allowing the various social actors to participate in decisions and to create instruments that allow citizens to express their right to have rights.

And yet, one of the main issues raised in interpreting social inequities is in establishing the direction of the analysis. Such deepening raises questions about the information potential of intra-urban disparities: do the differentials explain the existence of a deteriorated process of local and excluding public policy, or do such distortions establish a spatial and temporal direction to be configured as new policies are created with the purpose of attaining equity in the various urban settlements?

Both situations beget different scenarios in the process of describing problems that have to be faced and in the development of a future agenda. The direction to follow becomes diffuse as a function of the actors establishing the priorities. This happens because, even with a consistent diagnosis, the established framework suggests intervention in strikingly extreme aspects, but implies a new way of thinking threshold processes of contradictory decisions, that certainly do not involve only those who make decisions, but all the participants of daily life.

Thus, the ways to measure deterioration of the physical and social environments that consolidate local development must be expressed differently, not only regarding the different kinds of deprivation, but also in regard to the way in which they are spatially distributed. This interpretation shows that social problems are not homogeneous and are related to a deep gap existing between economic growth and social development. The situation becomes even more serious when the trend towards market development in developing economies associate high growth rates with high unemployment rates, leaving a considerable part of the population out of the private consumption process.

These aspects lead to the understanding of the dynamics of cities – the privileged stage, where the complex story-line created by development, unfolds – and which is characterized by heterogeneous levels of life conditions in its multidimensional space. Based on this structure of global heterogeneity and local homogeneity, the intra-urban differentials become one of the analytical tools for these issues.

The analysis of intra-urban differentials consolidates the practice of systematically evaluating the quality of life of urban populations, with the purpose of substantiating the direction taken by critical actions already used in developing the city: one that creates and organizes the structure so that it can work well, and another aiming at providing every citizen with a life of dignity and quality. All this within the multifaceted context of homogeneity and heterogeneity.

The Quality of Life in Curitiba project is structured to include the largest possible number of urban areas so that their maximum potential can be explored and expressed in terms of indicators bearing an impact on the life of its inhabitants and the city's environment. Thus, some points are crucial in characterizing urban life monitoring, and are inherent objects of this project:

- Characterization of intra-urban differentials, establishing life conditions indexes for each micro-area (neighborhood) and the municipality as a whole;
- Constant monitoring of quality of life in the municipality as a whole and in the different micro-areas, in order to observe local and global evolution;
- Detection of areas needing greater social, economical, infrastructural, and environmental intervention or formulation of specific and more inclusive policies;
- Dissemination of analytical information concerning global and local results in specific areas enabling this information to stimulate changes in the local context or to promote the enhancement of collective knowledge;

- Preparation of maps for better visualization of the conditions of life in the city and area distribution;
- Subsidies to urban planning and creation of specific policies for the municipality, stressed as a criterion for prioritizing actions in areas with greater urban differential.

Monitoring and Local Level

Is there a real need for all-inclusive monitoring, if the implementation of urban projects takes place under the argument that local actions are always conditioned to domestic and international structural issues? It is obvious that they are, but to what extent local power can find the right tools to accomplish more fruitful actions? These questions arise from discussions on quality of life, usually associated with physical and social development, access and supply of services to populations. An inherent aspect to quality of life is the fact that it necessarily attaches life conditions to the equity that is heterogeneously distributed across the city, and which requires analytical processes at homogenous local contexts.

This is consolidated through a system which selects, applies, and evaluates local data and indicators which, when disseminated, involve all local actors, population at large, and managers, fulfilling the essential function of providing an instrument to local planning. The local level is more suitable for visualizing immediate difficulties, since they are instantly exposed. At the same time, global difficulties can be observed from the same distance by the average observer.

Methodologies Used

The Quality of Life in Curitiba project began in 1996, at IPPUC – Urban Planning and Research Institute of Curitiba, and was conceived from discussions that aimed to include the city in the worldwide Health Cities Network, whose method had already been tested at the institution. The need arose from the fact that one single section could, not only concentrate information on several agencies across the municipality, but also widen this database to include a more critical analysis. Thus, starting by using information generated from the various sections, a methodology capable of creating parameters, indicators and concise indexes was used, not only from specific areas, but also from several other areas.

The Genebrino or Distance Method

To measure Curitiba's quality of life, the Genebrino or Distance method was initially used, basically measuring preferential variables as results from social benefits secured by a given population. For such, the population's life standard is accepted as the actual state of real life conditions and not as desired or expected conditions. In this context, the accepted population's standard of living (Y) in one unit of time (t) and one unit of space (d = 1, 2, 3, ...), is the level of satisfaction of material and cultural needs in domestic economies (y 1td, Y 2td,, Y k-1td, Y ktd) obtained through the flow of goods and services paid (labor – income) and collective consumption flows (Sliviany, 1996).

By establishing minimum and maximum thresholds, the position of the value that is being analyzed is obtained in relation to an optimal situation. The thresholds are established by using the average of the worst and best empirical values found in the city's neighborhoods – a logical statistical criterion, which the quality standards of the city are taken into consideration. The thresholds may also be derived from parameters external to the city, aiming at consolidating an overview of the local reality in relation to global issues (national, state, and municipal levels).

Results provide the means for a general analysis of the city's social (synthetic index) and sectorial (group index) growth and partial indexes for the housing, education, health, and transportation sectors. Such a process allows analysis from the general to the particular and vice-versa. Furthermore, the establishment of life conditions indexes for each neighborhood warrants the characterization of intra-urban differentials per quality of life satisfaction level. The following groups of needs were included, due to their importance to quality of life and to the availability of information, at the time, as shown in Table 1.

The global social growth rate (housing, health, education, and transportation) reached a satisfaction rate of 64.59% in Curitiba, only 35.41% short of reaching optimal development.

This situation comprehends all social needs, theoretically constructed, situated in relation to national and international parameters and/or logical and statistical criteria, within Curitiba's typical empirical distributions variation area. Transportation is the most outstanding sector, reaching 67.34%, followed by health, with 64.62%, housing, with 63.38%, and education, with 63.19%.

The equality in satisfying primary needs' group indexes expresses a balance in political intervention at municipal level. The transportation sector, a secondary need, according to theoretic conceptual marks in the theory of needs, should, in general, reach lower satisfaction levels than those of primary needs. In Curitiba, owing to a tradition of public investment in this area, the situation is inverted.

Although the indexes point at a relative homogeneity among the sectors, the same does not happen with the intra-urban analysis, where significant differences may be observed among partial indexes. The analysis carried out in Curitiba, as a whole, was also applied to each neighborhood in particular, taken as the smallest homogeneous scale of municipal division. Map 1 shows intra-urban differentials, according to the quality of life satisfaction synthetic index classification, by neighborhood, in Curitiba.

Table 1 – *Quality of Life in Curitiba: Partial, Group and Synthetic Indexes. Developed by: IPPUC/Monitoring/96*

QUALITY OF LIFE - CURITIBA							
Social Needs	*Unit*	*Minimum Value*	*Empirical Value*	*Maximum Value*	*Partial Index* 0% - 100%	*Group Index*	*Synthetic index*
1. Housing						63.42	*64.62*
1.1 Households in slums	%	15.51	8.05	0.14	48.54		
1.2 Person per household	*People*	4.63	3.68	2.86	53.67		
1.3 Households connected to sewerage	%	66.46	83.35	94.19	60.91		
1.4 Household connected to water systems	%	83.40	95.50	100.00	72.89		
1.5 households with solid waste collection	%	86.95	97.53	100.00	81.07		
2. Health						64.62	
2.1 Infant mortality	*/1000*	54.00	23.87	10.00	68.48		
2.2 Neonatal low weight	%	11.61	8.75	6.63	57.43		
2.3 General mortality	*/1000*	12.00	5.98	4.00	75.25		
2.4 Life expectancy from birth	*Years*	66	70	76	40.00		
2.5 Diarrhoea incidence	*/100.000*	4718.55	1364.54	110.43	72.78		
2.6 Tuberculosis incidence	*/100.000*	90.41	47.18	18.72	60.30		
2.7 Preventable diseases	*/100.000*	35.56	10.53	3.51	78.10		
3. Education						63.19	
3.1 Pass-fail rate	%	26.67	15.53	4.39	50.00		
3.2 Truant rate	%	19.23	7.15	0.00	62.82		
3.3 Success rate	%	62.31	77.33	86.74	61.48		
3.4 Literacy rate	%	73.97	94.11	99.23	79.73		
3.5 Age degree adequation	*Years*	2.1	0.80	0.00	61.90		
4. Public Transport						67.41	
4.1 Frequency	*Minutes*	17.61	10.25	6.00	63.39		
4.2 Access to the transport integrated network	%	0.00	60.24	100	60.90		
4.3 population's level of satisfaction	%	0.00	58.00	100	58.00		
4.4 Efficiency of the journeys	%	90.00	98.80	100	88.00		

In Curitiba, 61.76% of all neighborhoods, corresponding to 798960 inhabitants, have a social needs satisfaction synthetic rate higher than 60.00%; 43.00% of which show a quality of life satisfaction synthetic rate higher than 64.59% (table 2). Despite this global situation, the city shows a high heterogeneity if analyzed from the local level (neighborhoods) viewpoint.

Table 2 – *Demographic Distribution According to Synthetic Index - Curitiba Developed by: IPPUC/Monitoring/96.*

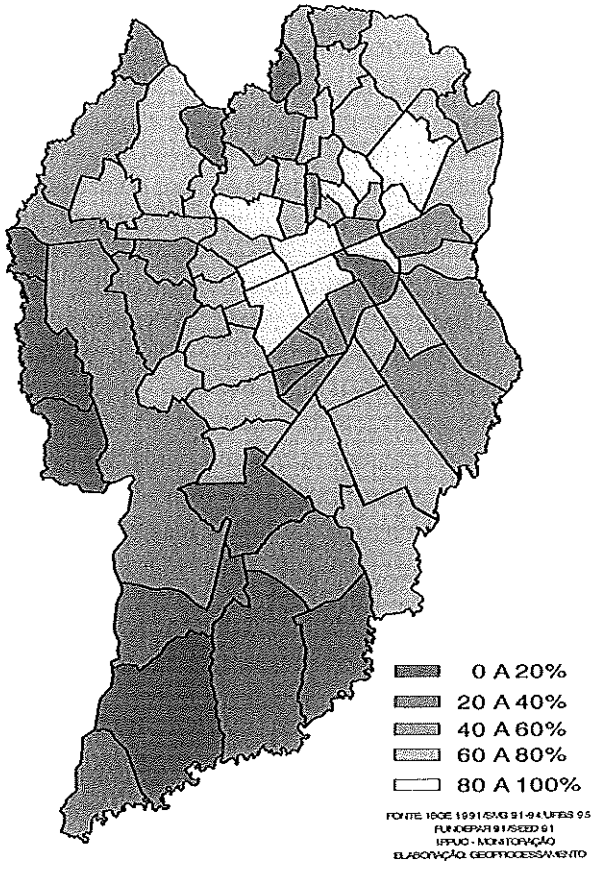
RANGE (%)	TOTAL POPULATION	%
0 ---I 20	10.161	0,77
20 ---I 40	80.138	6,09
40 ---I 60	425.776	32,38
60 ---I 80	611.692	46,52
80 ---I 100	187.268	14,24

Source : IBGE/91

Atypical neighborhoods can be detected through typical variation areas, that is, those areas with the lowest or highest social needs satisfaction rates. For further details see Quality of Life in Curitiba, Vol. I and 2 – IPPUC (1996 and 2000).

It is important to emphasize that this methodology becomes more effective when applied in a systematic way, allowing to register the evolution of a set of variables, in time. Furthermore, it is important to extend measurement to other areas of significance in determining life equality of a given population, such as nutrition, public safety, social welfare, the environment, recreation and leisure. New indicators such as the environment and safety are currently being incorporated as a means of providing continuity to this methodology.

Map 1 – *Synthetic Life Quality satisfaction index, per neighborhood, in Curitiba*



Note : The synthetic index is comprised of housing, health, education, and transportation

Geographic Information System (GIS)

Tools to establish urban geographical references have been widely used in trying to understand city dynamics. This process became an integral part of life quality analyses in 1997, when empirical data used in the Genebrino method began to be recorded on-site. The first step was the correlation between health and the city's socio-environmental conditions. Information previously recorded as relative data were then observed in their absolute version. Each damage case was recorded on the actual site where it occurred. Today, other areas such as education, housing,

and so on, constitute the focus of spatial analyses and confrontation with other methods used for measuring quality of life. In this paper, the analysis is more specifically concentrated in issues related to health, and quality of life, on site, bringing in other information extraneous to the Genebrino method, thus contributing to a better view of reality.

GIS is an information system developed in a specific software, which in turn, uses a Database Manager System (Strauch, Souza 1998). It consists of electronic data processing structures that retrieve, store, handle, analyze, demonstrate, and report geographically-based data. The main feature of GIS is that it focuses on the relationship of a real phenomenon with its spatial location (Medronho, 1995). Two important aspects of using GIS in health are the application of "*cluster*" analysis and "*map-smoothing*", both still used in an incipient way as methods (Briggs, Nurminen, 1996). The present analysis consists of the superposition of maps and characterization of homogenous indicator areas.

This project included an existing well-established geographical base, with coordinates defined and constructed over a decade, through several applications. In order to pinpoint thematic data, health events, in this case, a simplified but extremely accurate application was used, capable of showing the block in which the event took place, thus making it possible to observe information at local and municipal levels, with the same clarity. The alphanumeric data base comes from the Health Information System, standardized throughout the municipality.

The basis of this project is to contemplate problems in health that might reflect aggression or degradation of the environment (Hepatitis, Leptospirosis, and Loxoscelism – caused by the bite of the brown spider) or a weakened socio-economic situation (Tuberculosis) and their relationship with other social information. The specific geo-reference approach to health contains information regarding incidence coefficients and mortality, by neighborhood and by class, that is, value intervals that characterize conditions common to the various regions. In this group, in addition to the same data used in the Genebrino methodology, children mortality, AIDS, standardized general mortality, immunopreventable diseases, low-weight at birth, and diarrhea are also included. With the exception of diarrhea, presenting data collected in 1997, all maps are based on the average of years 1995, 1996, and 1997. This group explains, in a more diversified way, the profile and the spatial composition of urban health in Curitiba.

The health-related data are integrated, through interposition, with socio-environmental information about the city, structured as follows:

1. Information about intra-urban differentials for the municipality as a whole, regarding cases, incidence and mortality coefficients;

2. Geo-processed information about degraded conditions across the entire municipality, establishing a correlation with water supply, green areas, and social equipment, sub-inhabited areas, family income, contaminated water sources and wells, sewage system, potential flood areas;
3. Geo-processed information about degraded conditions at the Sanitary Districts, establishing a correlation with water supply, green areas, and social equipment (including health equipment);
4. Geo-processed information about degraded conditions in city neighborhoods, establishing a correlation with water supply, green areas, social equipment, road network, and urban structure.

It is important to point out that the purpose of this project is not to carry out a deep epidemiologic-spatial analysis of Curitiba, since for such, other instruments and information are necessary, requiring a more multi-sectorial and encompassing dimension. Thus, the purpose of this approach is to map some of the health conditions faced by inhabitants and their relationship with life conditions in other sectors, since the areas cannot be dissociated in this operating space.

Based on the understanding that quality of life exposes inequalities in life conditions, the GIS provides additional information, characterized as micro risk-areas, either due to the concentration of occurrences or to the superposition of several events. The examples above only illustrate the analytical potential of this system, since for a complete analysis it would be necessary to have all maps in order to interpret this social structure in a more consistent way.

Cluster Analysis

Cluster analysis is a new element that allows the analytical scenario of intra-urban differentials to be potentialized. It also allows the inclusion of peculiar elements to the analysis: contrary to the Genebrino method, which establishes a value scale (poorest and optimal situation) already included in the construction of indicators. This method does not forsake judgment, but rather it prioritizes the placement of similar things in different groups. It is up to the observer to attribute value to the results, by considering them either good or bad. That is, the clusters follow an order of magnitude, but are not defined according to the scales of a desired situation. This is useful, as it is the case with other methodologies, in rendering intra-urban differentials concrete, for the clusters created account for the different conditions of life in the heterogeneous space of the city.

The purpose of cluster analysis is to find a system to organize observations into sets sharing common properties, gather information

and combine it in such a way as to classify them into similar groups. This method makes it possible to choose among several algorithms of a different classification nature, where each choice may result in a new cluster structure. In order to combine this information, the method uses the similarity concept, or distance among the objects, creating a dissimilitude matrix. The dissimilitude matrix is calculated through a distance measurement, Euclidean in this case, that is, a geometrical distance in the multidimensional space.

The difference between a dissimilitude matrix and a correlation matrix in cluster analysis is that the latter contains similarities among variables (i. e., income and education), while the former contain similarities among observations (neighborhood *x*, neighborhood *y*).

After the distance between the objects has been defined, the next step in cluster analysis is to classify the clusters in groups, according to their distances. There are several methods to do this. The technique proposed in this study is "complete linkage" or "furthest neighbor", which determines the cluster according to the furthest objects (Aldenderfer, Blashifield, 1984; Johson, Wichern, 1992).

An important decision in this type of analysis is the choice of variables representative of the phenomenon under study, that is, the selection of an irrelevant variable will not help in group classification. For example, the inclusion of the mean average temperature at neighborhoods does not help to establish an intra-urban differentiation, but would be valuable in differentiating countries (Everitt, 1993).

This methodology's approach includes the following:

1. Construction of a multicentric cluster, by using different indicators, to place Curitiba within the national social structure, among the capitals;
2. Construction of clusters in the areas of health, income, education, and housing regarding data gathered in 1991 for Curitiba's intra-urban differentials;
3. Construction of clusters in the areas of health, safety, education, and housing regarding data gathered in 1996 for Curitiba's intra-urban differentials.

This analyses takes place in these contexts so that the methodological observation may cut across various situations: Curitiba in time (1991 and 1996) and space (internal intra-urban differentials) and within the national scenario (external). It is assumed that 1996 represents current reality, because it was the last population count.

Intra-Urban Cluster Analysis for Curitiba

In order to carry out the intra-urban analysis of Curitiba, a few quality of life indicators, referring to 75 neighborhoods, were studied, with the purpose of forming clusters of similar neighborhoods regarding each compound indicator, allowing to characterize homogeneous areas, with the purpose of providing subsidies for intervention policies, based on the clusters presented.

The following indicators were used for this analysis:

Table 3 – *Intra-Urban Cluster Analysis Indicators*

COMPOUND INDICATORS	PREVIOUS EMPIRICAL DATA	CURRENT EMPIRICAL DATA
INCOME	• % of family heads earning up to two times the minimum wage; • % of family heads earning more than 15 times the minimum wage; • Family head's median income Source: IBGE – 1991 Census	The data were not collected during the 1996 Population Count
HOUSING	• % of houses connected to the public water system; • % of houses connected to the public sewage system; • % of houses with garbage collection; • % of houses in sub-normal settlements; • Average number of inhabitants/house Source: IBGE – 1991 Census	• % simple houses; • % of luxury and high luxury houses; • Inhabitants per house; • Constructed area median Source: IBGE – 1996 Population count and Municipal Finance Secretariat
HEALTH	• Infant Mortality coefficient; • % of low-weight children at birth; • Diarrhea coefficient; • Tuberculosis coefficient; Source: Municipal Health Secretariat – 1992 to 1994	• Infant mortality coefficient; • % of low-weight children at birth; • Diarrhea coefficient; • Tuberculosis coefficient; • Immunopreventable diseases; Source: Municipal Health Secretariat – 1995 to 1997
EDUCATION	• Literacy Rate; • Approval Rate; • Failure Rate; • Abandonment Rate; Source: Fundepar and State Education Secretariat - 1991	• Literacy Rate; • Approval Rate; • Failure Rate; • Abandonment Rate; Source: Fundepar 1996
SAFETY	Not available – The Violence Information System was created later.	• Theft and robbery rate; • Homicide rate; • Aggravated assault rate; • Crimes against the moral; • Drug usage rate Source: Military Police - 1996

It is important to point out that indicators were chosen with basis on data availability at the time, since in order to visualize the clusters in time it is necessary to maintain similar indicators. Income and safety were chosen on account of their importance to the country's reality.

Current Intra-Urban Cluster Analysis for Curitiba

In order to carry out intra-urban monitoring and analysis of the city, the same study was performed either previously or currently, but with a change from the income indicator to safety, due to the lack of information on income in IBGE's Population Count. The analysis in this paper is concentrated into two areas, Safety and Health, although the following indicators were used in this analysis:

1.Safety
2.Housing
3.Health
4.Education

Owing to the impossibility of obtaining the same indexes used in 1996 for each indicator, some new indexes were introduced in the evaluation of quality of life, while others were left out due to insufficient data gathered for the current Population Count (IBGE). Therefore, the comparison between the periods was hindered, since the indexes are not the same for evaluating the same quality of life indicators.

Compound Safety Indicator

The safety indicator was not mentioned in 1996, owing to the difficulty in obtaining data, an issue that is being equated with the creation of the Violence Information System, which made this study possible. According to the variance analysis, all variables are significantly different in at least one of the neighborhood clusters.

In the safety indicator, it can be observed that the number of cases for each type of crime presents high variability, cluster 1 showing an average 11.76 robbery per 10,000 inhabitants, as opposed to 458.1 in cluster 5 (representing just the city's downtown area).

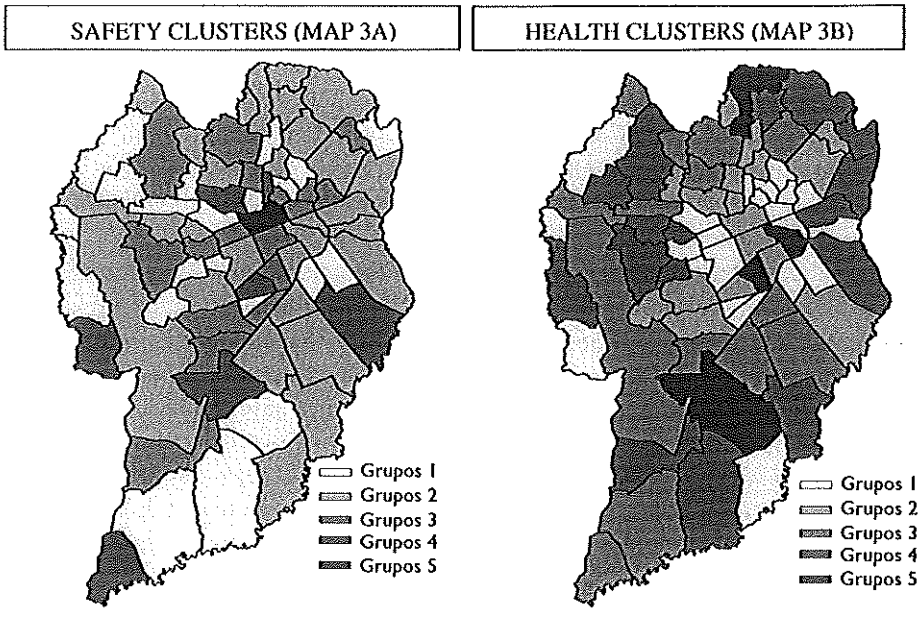
Compound Health Indicator

In the analysis of the health indicator cluster for the population of Curitiba 6 variables were used as differentiation parameters, differing from the analysis carried out in 1991 owing to the inclusion of standardized general mortality variables and immunopreventable diseases. It can be observed through the variance analysis that all the variables are significantly different in at least one of the neighborhood clusters.

The safety map shows few neighborhoods in Curitiba with high violence rates. These are concentrated namely in the city's downtown area. In comparison with violence indicators from other cities, it can be observed that the neighborhoods included in Cluster 5 are a minority. In a direct confrontation with health, the inverse relation of clusters becomes

very clear, something common to the other areas as well. This points to a potentially biased version that the best areas concerning health, housing, and education are the worst in terms of safety. There is a dynamism inherent to the urban environment, where trends are constantly questioned, requiring more complex analyses and new approaches. This also shows that a single analysis used as a basis for constructing a synthetic indicator comprehending all the clustered areas cannot be consolidated in methodological terms, since the application cannot aggregate clusters from all these different fields into a single one. This indicates that the methodologies point to a given direction that must be interpreted by ourselves, also suggesting more thinking in order to understand the trends and questions arising from what is now known to be true.

Map 3 – *Intra-Urban Clusters Models*



Developed by IPPUC - Urban Research and Planning Institute of Curitiba
Source : Military Police - 1996 / Municipal Health Secretariat - 1995, 1996, 1997

Some points stand out as a result of the methodologies used:

– Social discrepancies are highlighted in the result analysis, namely when the object prioritized points at urban inequalities. The theme maps illustrate similar aspects of life conditions in the city, where the problems are concentrated, and what are the areas in which there is a greater need for intervention.

- The expressions of homogeneity and heterogeneity in the urban space are drastically explicit, more so in the visualization allowed by the graph showing two-way joining results, where the vertical analysis potentializes the perception of the differentials through extreme variations of different colors and shades used (i.e., housing in capital cities is more heterogeneous and uneven as opposed to longevity, which presents fewer variations).
- The various methodologies expose different areas (more or less unequal, more or less coincidental) in terms of social result, reinforcing the need for several analyses using various methodologies so that the quality of life of a city can be apprehended.

Final Analysis

Measuring quality of life has proven to be a task involving complexities, whose interpretation requires constant conceptual and methodological investigation. Conceptually speaking, issues related to quality of life have advanced considerably in the light of the social determinants of quality of life and development. However, analytical measurements are still a major challenge to be overcome, particularly when different assessment tools are used, especially those with inherent methodological biases and typical obstacles to this process.

As part of the continual search for enhancement, a current version of the Genebrino method; the use of GIS in the areas of safety, education, housing, and transportation, among others; and cluster analysis with a wider use of indicators and greater analytical power are being implemented in Curitiba, already in the conclusion phase. A perspective for the application of Main Components Analysis, Correlation Analysis, and Factor Analysis, using the same data base, or not, is being designed for the near future, contemplating a possibly association with methodologies such as the Healthy City Indicators (WHO, Europe) or Sustainable Development Indicators (UNDP).

The function of the indicators is clear, since they shed light on a given aspect of reality, and the larger their cluster, the more elements will be available to enable social actors to understand and change their reality (Pólis, 1995). However, the transformation of the qualitative-quantitative process becomes pretentious when the only source of analysis officially recorded data, dealt with as absolute truths. Furthermore, indicator interpretation should be understood as a minor reflection of the complexity of everyday reality and should not be taken as its expression. Their definition and choice, usually a function of the data available, as well as their validity, necessarily include the typical faults of a bureaucratic analysis. Besides, the inclusion of compound indicators only portrays

partial aspects of urban dynamics, and cannot represent it in its entirety. All this is added to methodological uncertainties and to interpretations that vary according to the observer's standpoint.

Therefore, it is worthwhile to come up with means which, albeit in an incipient way, are capable of shedding a light on how society is systematized. One of the purposes is to detect urban malfunctions, particularly those issues that overcome methodological barriers and stand out as important, attracting our attention. These areas would probably be totally forgotten in the absence of some kind of analysis, maybe owing to the fact that their inherent power to change reality are even weaker than the analytical language of the various methodologies, loaded as they are with so many faults. Therefore, it is important to point out that methodological construction is a process that must also be monitored and restructured in time, but never cast aside or abandoned.

As a function of this consideration, table 4 makes a comparison of the methods used:

Table 4 – *Methods comparison*

METHOD	AT EVALUATION	AT SINGLE LOCATION	IN TIME	IN INTRA-URBAN DIFFERENTIALS (Local environments)
GENEBRINO	Attributes value according to satisfaction scale (0 to 100%), implying judgement of the situation	Adds other parameters. Locates total reality in the analysis in relationship to other contexts. Constructs a synthetic indicator of the whole (city).	Difficulty in working on monitoring due to the construction of thresholds based on temporal parameters.	Has greater validity when parameters originate in reality at stake than external parameters (logico-statistical and standard deviation)
CLUSTER	Establishes clusters according to identity without attributing satisfaction values. Judgement depends on the observer.	Difficulty in creating a single synthetic indicator of the whole, because its mechanism concentrates on grouping indicators based on their similarity.	Suitable, provided it is obtained from similar indicators.	Excellent for homogenizing and heterogenizing intra-urban life conditions. Presents differentials according to their similarity.
GEOGRAPHIC INFORMATION SYSTEM (GIS)	Opposes spatially distributed information	Works with the whole based on information on the particular. Does not provide single information on the whole.	Valid if absolute values are rigorously recorded and if there is data available.	Effective in analyzing indicators or absolute data in characterizing micro risk-areas.

Table 4 suggests that each methodology plays a role according to the approach used. It is important, however, to underline some considerations about the methodological development of this analytical process:

- Restrictions imposed by the availability of information are a determining factor in constructing indicators and in establishing more homogeneous maximum and minimum thresholds (Genebrino method).
- The need for availability and direct access to sources of information is imperative, because in addition to building a more democratic system, they also provide a more accurate result, much closer to reality, with fewer biases and more reliable data.
- All methods have biases and discrepancies. The challenge is to understand them in order to overcome them.
- There is a need for consolidating representation in reality indicators of a given area.
- The use of "proxy" indicators in certain cases is sometimes inevitable to measure an abstract variable.
- Most indicators and methodologies measure the effectiveness of urban services and the population's access to them, thus establishing a management result profile, but not as an instrument to visualize life conditions resulting from other processes.
- Large scale of indicators (a necessary evil) are far from local reality, which usually contemplates only part of the issues raised.
- Methods require specialized data, which hinders their use at all city levels, and limits the selection to few analysis variables.
- The varied use of methodologies provides us with more meta-analytical power, since we are able to observe reality from different angles.
- Methodologies, indicators, analysis, and possible implemented policies play a role in establishing a culture where urban dynamics is continuously monitored.
- Analytical results, in addition to explaining local realities to guide policies, must reach the observed population, so that information can create critical concepts about local reality, the crucial issue in forming a certain population's perception of what quality of life is.

Other issues are equally important in measuring urban environment, in Curitiba and elsewhere, as a way to deepen topics as a phenomenon of the "metropolization" process affecting cities, population's aging process, issues regarding agricultural zones with suitable social indicators, determination of health indicators for small areas, and expansion of assessment tools to meet the demand of potential users, and evaluation of areas short of educational equipment.

This suggests the combination of existing systems for developing local interaction methods, because facing urban problems is not limited to identifying, measuring, and controlling risks, and characterizing them as macro issues. It is, first and foremost, a matter of understanding the dynamic process that takes place in cities as a representation of the population and its characteristics. Therefore, this population is able to understand that it can change its own reality (Stephens, 1995).

The improvement of these systems, as well as insertion of researched and revised elements and tabulated data, will design the methodological profile whereby local populations, in possession of these data, will become the makers of their own policies. The perception that a population has also reflects the levels of information they have access to. The perception is richer the more visions, different foci, and clarity of results it includes. As such, it interacts with evaluations of urban space, because they become their essential components and may clarify once less evident issues, circumscribed to the urban context. A population's perception advances as it receives contributions and continuous updates on the monitoring of its current policies. This process suggests reciprocity and mutuality in the creation of environments with more quality of life. The only way to create a revitalized perception that would enable citizens to interpret their environment is based on the information at their disposal which can, in turn, be translated into priorities.

Therefore, other means of producing information and data are critical for both conceptual and analytical advancements. The creation of discussion forums such as local inter-thematic councils, venues for appropriating reality, where diagnosis and decision making would widen the view of quality of life, since it includes various facets of life and must be treated as to integrate the various aspects. Furthermore, information dissemination requires direct communication with the population such as the implementation of situation rooms or interactive spaces, viewed as a critical part of this process.

Quality of life is measured through just a fraction of the movements made by urban space and human beings. These are only parts of what can be exposed and measured, among all the complexities of man. It is the pretense of trying to transcribe the motions of life into concepts, figures, calculations, analysis...

But life is much more than this.

REFERENCES

AKERMAN M.-A., 1998, *Construção de Indicadores Compostos para Projetos de Cidades Saudáveis*, Um Convite ao Pacto Transetorial – Capitulo 13, 319-334, in EV Mendes (orgs.), *A Organização da Saúde no Nível Local*, Editora HUCITEC, São Páulo.

BATTAGLIN MACHADO P. H., 1996, *Quality Of Life Indicators In Curitiba*, Analysis Of The Method And Policy Process Dissertação de mestrado. London School of Hygiene and Tropical Medicine, University of London, Londres, Reino Unido, 36 p.

BLEY D., VERNAZZA-LICHT N., 1997, « La Multiplicité des Usages du Terme de "Qualité de Vie" ». Qualité de Vie. Santé, Écologie et Environnement. CVM. *Prévenir*, 33, 7-14.

BRIGGS D., NURMINEN M., 1996, *Approaches to Linkage Analysis:* Overview p. 93-119. In Linkage Methods for Environmental and Health Analysis, UNEP, WHO, USEPA (orgs).

BRIGGS D. et al., 1996, Development of Environmental Health Indicators p. 19-54, in *Linkage Methods for Environmental and Health Analysis*, UNEP, WHO, USEPA (orgs).

DEMO P., 1995, *Avaliação Qualitativa: polêmicas do nosso tempo.* 5ª Ed. Autores Associados. Campinas-SP.

DOWBOR L., 1996, *A produção de qualidade de vida nas cidades* – Qualidade de Vida e Riscos Ambientais – Debates Sócio-ambientais – CEDEC.

EVERITT B.E., 1993, *Cluster Analysis*, 3rd Ed. John Wiley & Sons Inc. London. 170 p.

FLECK M.P.A., 2000, *O Instrumento de Avaliação de qualidade de Vida da Organização Mundial da Saúde (WHOQOL – 100): Características e perspectivas.* Revista Ciência e Saúde Coletiva. Vol. 5 : 36-38

GOUZEE *et al.*, 1995, *Indicators of Sustainable Development for Decision-Making.* Report of the Workshop of Ghent, Belgium

GREEN L.W., Kreuter M.W., 1999, *Health Promotion Planning* – An Educational and Environmental Approach. 3rd. Edition. Mayfield Publishing Company.

HAMMOND *et al.* 1995, *Environmental Indicators: A systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development.* 72 p. World Resources Institute.

IPEA, PNUD, IBGE e Fundação João Pinheiro, 1998, *Desenvolvimento Humano e Condições de Vida: Indicadores Brasileiros.* Atlas do Desenvolvimento Humano no Brasil. 140 pp.

IPPUC, 2001, *Qualidade de Vida em Curitiba 1996 e 2000*, Vol. 1 e 2, Instituto de Pesquisa e Planejamento Urbano de Curitiba.

Prefeitura Municipal de Belo Horizonte, 1996, *IQVU, Índice de Qualidade de Vida Urbana.* Secretaria Municipal de Planejamento. 32 p.

JOHNSON R., WICHERN D.W., 1992, *Applied Multivariate Statistical Analysis.* 3.ed. New. Jersey: Prentice Hall. 732 p.

MEDRONHO R., 1995, *Geoprocessamento e Saúde*, Uma Nova Abordagem do Espaço no Processo Saúde Doença, Rio de Janeiro: FIOCRUZ/CICT/NECT, 135 pp.

MENDES E.V., 1999, *Município Saudável: Para quê? Como?* – Seminário Nacional sobre Municípios Saudáveis – Faculdade de Saúde Pública da USP, 19 e 20 de abril.

MINAYO M.C.S. *et al.*, 2000, Editorial - Qualidade de Vida e Saúde, Revista *Ciência e Saúde*, Coletiva, Vol. 5, nº 1.

PNUD. IBGE. IPEA, 1998, *Desenvolvimento Humano e Condição de Vida*, Indicadores Brasileiros, Brasília.

PÓLIS, 1995, *Como Reconhecer um Bom Governo?* O Papel das Administrações Municipais na Melhoria da Qualidade de Vida, 72 p., São Paulo.

PORTO M.F.S. 1998. *Saúde e Desenvolvimento*: Reflexões sobre a Experiência da COPASAD – Conferência Pan-Americana de Saúde e Ambiente no Contexto do Desenvolvimento Sustentável. *Ciência* & Saúde Coletiva – Revista da ABRASCO 3 (2): 33-46.

ROGERSON R. J. 1995. *Environmental and Health-Related Quality of Life: Conceptual and Methodological Similarities*, Soc. Sci. Med. *Nº. 10, Vol. 41: 1373-1382*

RUFFINO-NETO A. 1992. *Qualidade de Vida: compromisso histórico da epidemiologia.* Conferência proferida no 2º Congresso Brasileiro de Epidemiologia de 13 a 17 de julho. Belo Horizonte – MG

SILVA A.A. & MELÃO C.M.G. 1991. *O direito da qualidade de vida na cidade* – Ambiente Urbano e Qualidade de Vida, Revista Pólis 1 (3): 100-109

SLIWIANY R.M. 1997 - *Sociometria* - Como Avaliar a Qualidade de Vida e Projetos Sociais, Editora Vozes. Petrópolis. 182 p.

STEPHENS C. 1995. *The Urban Environment, Poverty and Health in Developing Countries*, Vol. 10: 109-121. In Health Policy and Planning. Londres.

STRAUCH J.-C.-M., SOUZA M.-J., 1998, *Uma Metodologia para Implementação de Sistemas de Informações Geográficas* p. 109-123, in AL Najar & EC Marques – Saúde e Espaço, Editora Fiocruz, Rio de Janeiro.

UNDP, Indicators *of Sustainable Development*, http://www.un.org/esa/sustdev/

WHO, *Healthy Cities Indicators*, Regional Office for Europe http://www.who.dk/tech/hcp/