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# Health, Quality of Life and Population Density: A Preliminary Study on ‘‘Contextualized’’ Quality of Life

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**ABSTRACT**. Quality of life concerns individual (physical and psychological health), interpersonal (social relationships) and contextual (environment) aspects, which are both subjective and objective. In considering contextual characteristics, empirical findings have demonstrated that people’s relation to their living environment is a key issue for their well-being. However, until now literature has paid little attention to population density as an element affecting quality of life. The present study aimed at assessing the predictive role of population density on the several domains of quality of life, along with socio-demographic characteristics and physical diseases. Participant were
344 subjects living in the Northern Italy area. A questionnaire with WHO Quality of Life Brief Scale, a checklist of chronic diseases and a socio-demographic form was used to collect data. Results showed that population density influences psychological, relational and environmental quality of life. Theoretical and policy implications are discussed.

Keywords: Quality of life, Health, Population density, WHOQoL Brief Scale

## 1 Introduction

More than 50 years ago, the World Health Organization (WHO) defined health as “a state of complete physical, mental and social well-being” and not merely as the absence of disease, or infirmity. This definition includes bio-psycho-social aspects and well-being, along with other concepts used to enrich it, each of which better specifies a particular aspect: quality of life, status, lifestyle, life satisfaction and mental state. The

last few years have witnessed particular attention paid to the link between health and quality of life (Michalos et al., 2000).

Quality of life is defined by the WHO as "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (WHOQOL Group, 1998). For a detailed review of theorerical perspectives on quality of life, see Sirgy 2011). It concerns individual (physical and psychological health), interpersonal (social relationships) and contextual (environment) aspects, which are both subjective and objective. Indeed, it is clear that all these factors interact with one other (Cummins 2000), arriving at a point where they regulate each other (Cummins and Nistico 2002) without losing specificity (Camfield and Skevington 2008).

It is well established that socio-demographic characteristics play a key role in quality of life. Older people, for example, are less likely to be in physical and psychological health, whereas persons with high incomes and individuals with marital relationships report higher levels of quality of life (De Girolamo 2001; Marmot 2004; Michalos et al. 2000).

Recent literature on contextual factors has paid particular attention to the place of residence. It has been clearly shown that people's relation to their living environment is a key issue for their well-being (Rollero and De Piccoli 2010a), and for physical and mental health (Kawachi and Berkman 2003; Wen et al. 2006). This topic has been developed from different points of view, according to an interdisciplinary perspective: epidemiology, public health, medical geography, medical sociology, health policy, etc. In particular, some studies have focused on territory characteristics, such as rural areas compared to urban/metropolitan ones. Even though it is possible to sustain that, in the world, the health state of people who live in rural areas is worse than those of persons who live in urban areas (Strasser, 2003), this concept cannot be generalized without considering the socioeconomic conditions of the specific place under investigation.

It is evident that people who live in a specific territory show peculiar characteristics associated to their health and quality of life. For example, it is well documented that education (Schur and Franco 1999) and access to sanitary structures (Larson and Fleishman 2003) are lower in rural contexts. Many studies report that integration and social support, which are higher in rural places, are positive predisposing factors to health status and decrease mortality risk (Giles et al. 2005; Seeman et al. 2001). Furthermore, difficulty in studying health and quality of life depends on the fact that

studies reported in literature are not always comparable or generalizable, as they have often been carried out in single countries, or specific regions (Comer and Mueller 1995).

In sum, many studies show conflicting results concerning health and quality of life in urban/rural areas (Galea et al. 2005; Judd et al. 2002).

However, now it is well established that there is no simple association between urbanization and health. Indeed, it is necessary to consider the heterogeneity of experience within and across various urban and rural situations, and the specific aspects of local environments that are causally related to health outcomes (McDade and Adair 2001). Since the definition of ‘‘urban’’ and ‘‘rural’’ varies across time and place (McDade and Adair 2001), other dimensions/constructs are necessary. In other words, what lies at the roots of urban and rural differences in health? The territory structure, different socio-demographic characteristics, or all these aspects taken together? In an industrialized country, what distinguishes a rural context from an urban place? If it is possible to affirm that these places are characterized by a different population density, then we prefer to consider the population density as a dimension distinguishing different places. Following this idea, recently population density has been studied not only in relation to the perception of the neighborhood's quality (Walton et al. 2008) but also in relation to quality of life. More specifically, Cramer et al. (2004) decided not to use urban versus rural categories, but, basing their study on previous research by Mitchell (1971), analyzed quality of life in respect to population density. They demonstrated that as Oslo's population density increased, the quality of life factor scores—subjective wellbeing, personal realization, friends, support in sickness, negative life events, the family relationships and the quality of neighborhood relationships—diminished proportionally (Cramer et al. 2004). However, findings on the relationship between quality of life and population density are not always convergent.

Indeed, Best et al. (2000) found no difference on quality of life among three different groups of subjects (farmers, ex-farmers, and metropolitan residents), despite deep contextual differences. They showed that the groups were different only in respect to social contacts and production activities (Best et al. 2000).

Concerning specific aspects of quality of life, literature has shown that in highly populated places physical health indicators are better than those of low density contexts (Costa 2008), whereas the opposite pattern has been shown for mental health (Holley 1998).

## 2 Aims and hypothesis

The general purpose of the current study was to assess the predictive role of population density on quality of life, along with socio-demographic characteristics and physical diseases. More specifically, three different kinds of predictors were considered: (1) sociodemographic characteristics (gender, age, marital status, income); (2) physical health; and (3) population density of the living place.
Following the multidimensional conceptualization of quality of life (WHOQOL Group 1998), the predictive role of independent variables was assessed separately for each domain of quality of life, i.e. physical, psychological, relational and environmental. Hypotheses were the following:

1. Based on previous studies, socio-demographic characteristics should influence all the domains of quality of life. More specifically, older individuals would report lower scores on the physical dimension (De Girolamo 2001), whereas married subjects and high-income people should report a better quality of life (Campbell and Jovchelovitch 2000; De Girolamo 2001; Fahey and Whelan 2005; Marmot 2004; Michalos et al. 2000). No gender difference is expected (De Girolamo 2001);

2. Chronic diseases should affect quality of life, especially in its physical dimension (De Girolamo 2001);

3. Population density should influence quality of life. In particular, people living in highly populated places should report higher levels of physical health (Costa 2008), but should obtain lower scores on the other three dimensions (Cramer et al. 2004; Holley 1998).

## 3 Method

### 3.1 Participants

The investigation was carried out in Piedmont, a region in the North-West of Italy. This region extends over 25,399 sq km and has 43% of highland territory, 27% of flat ground with the remaining 30% hilly. The population of 4.4 million inhabitants is distributed over 1,206 communities, with an average density of 160 inhabitants per sq km. Turin, the biggest city in the region and the fourth in Italy, has about 865,000 inhabitants and 6,647 inhabitants per sq km. The remaining eight districts have less than 100,000 inhabitants. Health services in the region are well developed.

A total of 344 adult subjects (57% female) living in Piedmont were enrolled into the study, using recruitment criteria based on the technique of convenience sampling. They were contacted via student assistants and were asked to participate in a study about quality of life. The rejections rate was 6.8%.

Subjects living both in high and low density areas were included. Forty-five percent of them were domiciled in Turin and its outskirts. Population density of their living place was drawn from the database of the Italian National Institute of Statistical (ISTAT). Globally, participants lived in areas with population densities that varied from four inhabitants per sq km to 6,647 inhabitants per sq km. Population density was then split into two groups: low, i.e. less than 500 inhabitants per sq km (58% of the sample), and high, i.e. more than 500 inhabitants per sq km (see Kroneman et al. 2010).

The average age was about 40 years old (SD = 15 years; age range = 18–88 years). Thirty-five percent of the subjects were under 30 years of age, 31% between 30 and 50: and 33% over 50. The education level was: less than high school in 6%, high school, or equivalent in 63%, and more than high school in 31%. Forty-five percent of the subjects were married. When occupation was considered, 25% were students, 53% employed, 18% retired or housewives, and the remaining 4% registered as unemployed. A list of five options was given to the respondents to identify their income levels. We then classified them into low (12%), middle (72%) and upper income (16%) brackets.

### 3.2 Measures

Data were gathered by a self reported questionnaire, which took about 15 min to be filled in.

The questionnaire contained:

1) A chronic disease checklist. In order to investigate their physical health, subjects were requested to tick off any physical problem from a list of the nine most common chronic diseases in the general population (i.e. high blood pressure, diabetes, arthritis; see ISTAT 2007).
2) The WHO Quality of Life brief Scale, i.e. the QoL brief version of the questionnaire set up by the WHO group (WHOQOL Group 1998; for Italian validation see De Girolamo 2001). This 24 items scale (5 point Likert) was created to assess quality of life and includes four dimensions: Physical Health (WHOQoL_PH: seven items, i.e. ‘‘To what extent do you feel that physical pain prevents you from doing what you need to do?’’, ‘‘Do you have enough energy for everyday life?’’), Psychological Status (WHOQoL_PS: six items, i.e. ‘‘To what extent do you feel your life to be meaningful?’’, ‘‘How satisfied are you with yourself?’’), Social Relationships (WHOQoL_SR: three items, i.e. ‘‘How satisfied are you with your personal relationships?’’, ‘‘How satisfied are you with the support you get from your friends?’’), and Environment (WHOQoL_E: eight items, i.e. ‘‘How healthy is your physical environment?’’, ‘‘To what extent do you have the opportunity for leisure activities?’’).

3) A socio-demographic section, to investigate gender, age, educational level, marital status, profession, place of residence and income.

### 3.3 Statistical analysis

All statistical analyses were carried out using the software SPSS 18.0. The statistically significant cut-off value was set at $p < .05$. First, we carried out descriptive and bivariate analyses. Then, to test our hypotheses hierarchical regression analyses were used.

## 4 Results

### 4.1 Descriptive and bivariate analysis

As above described, the survey cohort included adults, which were heterogeneous for age and gender-balanced. Their education, marital status and profession showed percentages similar to those of population living in Piedmont. The socio-demographic characteristics differed according to population density of their living context (< of 500 *vs.* > of 500 inhabitants per sq km). For education ($\chi^2 = 14.803$; $p < .01$) the denser the population the higher the education level, as literature has already shown (Marcellini et

al., 2007),. Furthermore, in highly populated areas, in respect to low density place, we observed a higher number of single ($p < .01$) and younger ($p<.05$) subjects, in a low income bracket ($p<.05$).

When chronic disease was investigated, 46.4% of the subjects reported no chronic disease, 29.8% one, 14.6% two and the remaining 9.3% three or more. 24% of the sample suffered arthritis, or other rheumatic disorder, 22% chronic allergies and/or sinusitis, 15% hypertension, 12% dermatitis, or other chronic skin affection, 8% blindness or difficulty in seeing even with glasses, 6% had a chronic lung disease, 6% complained of deafness or hearing problems, 3% diabetes, and 2% some form of cardiovascular disturbance. The frequency order of reported chronic diseases was the same as that of the Italian population as a whole (ISTAT 2007). The number of chronic diseases was positively linked to age ($r = .39$; p\.001). On the basis of these answers, for each subject we created a score summing every reported disease (from 0 = no chronic disease to 9 = all the chronic diseases on the checklist). As expected (Costa 2008), a correlation analysis showed that as the population density increased, the number of chronic diseases declared by the subjects decreased *(*$r = -.12$; $p < .05$).

Table 1 shows the average score, the Standard deviation and the correlations (Pearson *r*) among the WHOQoL subscales. All subscales were positively related.

Influences of density on WHOQoL subscales are reported in Table 2. People living in low populated places reported higher levels of quality of life both in the relational and in the environmental domain than individuals living in high density contexts.

## 4.2 Predicting Quality of Life

A further step in the analyses involved testing the predictive role of population density on each dimension of quality of life. Hierarchical regression analyses were used. In the first step, socio-demographic characteristics were entered (gender, age, marital status, income).

In the second step, an indicator of physical health, i.e. number of chronic diseases, was considered. Finally, the population density of the place of residence was entered.

Table 1 Correlations among QoL subscales, mean and standard deviation of each subscale

| | WHOQoL_PH | WHOQoL_PS | WHOQoL_SR | Mean (SD) |
|---|---|---|---|---|
| WHOQoL_PH | | | | 69.58 (12.37) |
| WHOQoL_PS | .58** | | | 60.21 (15.07) |
| WHOQoL_SR | .34** | .56** | | 68.05 (16.94) |
| WHOQoL_E | .46** | .53** | .38** | 56.73 (11.76) |

** p <.01 (2-tailed)

Table 2 T-tests: differences on QoL dimensions, according to low/high population density

| | Low population density Mean (SD) | High population density Mean (SD) | *T* value |
|---|---|---|---|
| WHOQOL_PH | 70.59 (16.46) | 69.10 (11.54) | n.s. |
| WHOQOL_PS | 61.54 (14.34) | 58.63 (15.45) | n.s. |
| WHOQOL_SR | 70.02 (15.66) | 65.26 (18.71) | 2.54* |
| WHOQOL_E | 58.00 (11.84) | 54.44 (11.96) | 2.73** |

* p <.05; ** p <.01

Table 3 Hierarchical regression analysis on WHOQoL_PH

| Predictors | Step 1 | Step 2 | Step 3 |
|---|---|---|---|
| Sex (being male) | -.10 | -.09 | -.08 |
| Age | -.16** | -.07 | -.08 |
| Marital status (being married) | .12* | .12* | .12* |
| Income | .22*** | .19*** | .20*** |
| Chronic diseases | | -.24*** | -.24*** |
| Population density | | | -.06 |
| *R2* | .08 | .13 | .13 |
| *R2* (corrected) | .07 | .12 | .12 |

*** p <.001;** p <.01;* p <.05

Table 4 Hierarchical regression analysis on WHOQoL_PS

| Predictors | Step 1 | Step 2 | Step 3 |
|---|---|---|---|
| Sex (being male) | -.15** | -.15** | -.14** |
| Age | -.10 | -.06 | -.09 |
| Marital status (being married) | .13* | .12* | .11 |
| Income | .27*** | .26*** | .27*** |
| Chronic diseases | | -.10 | -.10 |
| Population density | | | -.12* |
| *R2* | .11 | .12 | .13 |
| *R2* (corrected) | .10 | .11 | .12 |

*** p <.001; ** p <.01;* p <.05

The best predictors of the physical dimension of quality of life were the income and, more obviously, the absence of chronic disease. Marital status had also a positive influence, while population density played no significant role (Table 3).

Concerning the psychological subscale, being female positively affected quality of life, as well as a higher income. Moreover, living in a low populated area enhanced the perceived psychological quality of life (Table 4).

In the case of the social relations subscale, population density played a key role, as it was the strongest predictor. People living in a low populated place showed a better quality of life in this domain. Income had a positive influence also on this variable, as well as the marital status (Table 5).

Finally, when the environmental quality of life was considered, the variance explained by independent variables was the highest. Female reported higher scores. Moreover, this dimension was positively affected by the income, and negatively affected by population density (Table 6).

Table 5 Hierarchical regression analysis on WHOQoL_SR

| Predictors | Step 1 | Step 2 | Step 3 |
|---|---|---|---|
| Sex (being male) | -.08 | -.08 | -.06 |
| Age | -.01 | .03 | -.02 |
| Marital status (being married) | .15* | .15* | .13* |
| Income | .15* | .14* | .16** |
| Chronic diseases | | -.09 | -.10 |
| Population density | | | -.18** |
| *R2* | .05 | .06 | .09 |
| *R2* (corrected) | .04 | .05 | .07 |

** p <.01; * p <.05

Table 6 Hierarchical regression analysis on WHOQoL_E

| Predictors | Step 1 | Step 2 | Step 3 |
|---|---|---|---|
| Sex (being male) | -.12* | -.12* | -.11* |
| Age | .09 | .11 | .09 |
| Marital status (being married) | -.06 | -.06 | -.07 |
| Income | .40*** | .40*** | .41*** |
| Chronic diseases | | -.07 | -.08 |
| Population density | | | -.12* |
| *R2* | .19 | .19 | .20 |
| *R2* (corrected) | .18 | .18 | .19 |

*** p <.001; * p <.05

To sum up, population density contributed to explain variance of three dimensions of

quality of life, i.e. psychological, relational and environmental, whereas played no role on the physical aspects. Among socio-demographic characteristics, the best predictor was the income, which had a strong significant influence on each subscale of quality of life. Gender affected the psychological and the environmental dimensions, while being married enhanced the physical and relational quality of life. Finally, chronic diseases had a significant effect only on the physical subscale.

## Discussion

The present study aimed at investigating how each dimension of quality of life can be influenced by socio-demographic characteristics, physical health, and context's features, i.e. the population density of the living place.

Concerning socio-demographic characteristics, as hypothesized (Hypothesis 1), income is a significant predictor of all the quality of life components (Campbell and Jovchelovitch 2000; Fahey and Whelan 2005; Michalos et al. 2000). Marital status has a positive influence on the physical and the relational domains, in line with research demonstrating that intimate relationships increase health (Marmot 2004). However, gender and age play a role in contrast with our hypotheses. Indeed, women show higher levels of psychological and environmental quality of life. Although this aspect should be more deeply investigated, this datum could be related to a different relationship women develop toward the context they live in. As some studies pointed out (Rollero and De Piccoli 2010b; Tartaglia 2006), in their place of living in respect to men women have more social relationships, which in turn influence the attachment to the context. On the contrary, age plays no significant role, since it has a negative effect on the physical domain only when diseases are not considered.

When physical health is entered in the model, the presence of chronic diseases becomes significant and age per se has no influence. In other words, as supposed (Hypothesis 2), the presence of diseases negatively affects the physical dimension of quality of life.

Finally, our findings demonstrate a significant influence of population density on three domains of quality of life. As hypothesizes (Hypothesis 3), people living in low density places show higher levels of psychological health, relational and environmental quality of life. This is in line with Cramer et al.'s study (2004), which showed that a low density context is fundamental for quality of life, as it improves the subjective well-being, increases the number of friends and reduces the presence of negative life events.

As above argued, environmental characteristics significantly affect individuals' quality of life, although their role is often neglected. Although social indicators such as economic resources and gross domestic product form the milieu within which individuals live, their quality of life is determined by evaluation of their personal lives and social situation (Eckersley 2000). In this sense, we believe that quality of life is always strictly connected to the place individuals live in. This study represents an initial attempt to point out the influence of the place of living, as disease origins are beyond the sector of health (Annett and Nickson 1991). All these considerations can be particularly useful for social policies, since they show the necessity of considering the environment and the local context in defining the organization of social services.

Based on other studies (Cramer et al. 2004; McDade and Adair 2001), we decided to consider population density as a key factor, since literature has shown that simple dichotomous urban–rural classification is unacceptable for the investigation of place and health (McDade and Adair 2001). Indeed, there is a so considerable heterogeneity within urban and rural areas that other indicators should be looked for (McDade and Adair 2001).

However, this does not mean that the distinction between urban and rural places has to be neglected: future research could consider this distinction, along with population density.

We recognize that this study has some limitations, i.e. the 344 subjects represent a very small group compared to the extension of the territory investigated. The sample should be enlarged to strengthen present results. Therefore, caution is to be exercised in a generalization of our data.

Moreover, considering also that all the dimensions of quality of life are related each other (Table 1), important implications come to light, both from a theoretical and from an empirical point of view. On the one hand, present findings support a theoretical conception of health and quality of life in terms of interaction between objective and subjective dimensions. On the other, implications for specific policies could be underlined. Indeed, if the different domains of quality of life are related each other and depend on both subjective and environmental characteristics, health policies can not be conceived without considering the contexts people live in. This is in line with WHO's suggestions about the necessity of taking multisectoral action to create and develop health policies (WHO 1999).

It should be important following a perspective connecting the individual to the environment (relational, social, and cultural) into which he/she lives, in agreement with Morin's conception: ''A genetic component, a brain component, a mental component, a subjective component, a cultural component, a social component exist in any human behavior, in any human activity, in any fragment of praxis (…). It is possible (…) to reach the psychic through the chemical, to reach the biochemical through the psychic and, sometimes, to reach the one and the other changing the condition of the life'' (Morin 2001, our translation).

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