THE EFFECTS OF CHRONIC DISEASES ON PHYSICAL AND MENTAL WELL-BEING: A MULTILEVEL QUANTILE REGRESSION ANALYSIS.

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Aim. The main objective of this analysis is to evaluate the effect of chronic diseases on the perception of physical and mental well-being, taking hierarchical data structure into account. The effects are evaluated on Physical (PCS) and Mental Component Summary (MCS) indexes scores, derived by SF-12 questionnaire.

Methods. Data are drawn from the Italian household survey on "Health Conditions and use of Health Services" in 2005. Our analysis takes into account the hierarchical data structure and considers both individual characteristics and information related to socio-economic conditions and household context. Due to the pronounced asymmetry of the response variables and not normally distributed residuals, more robust estimation methods such as Linear Quantile Mixed Models are used. In order to take into account the hierarchical structure of the sample and at the same time assess the possible influence of the context on individual response, a multilevel strategy has been adopted.

Quantile regression estimates the conditional quantiles of a response variable distribution through a linear model and provides a more complete view of the relationships between variables. Introduced by Koenker and Basset (1978, 2001), they may be viewed as an extension of least squared estimation of conditional mean models to the estimation of an ensemble of models for several conditional quantile functions.

The multilevel linear models, likewise linear regression, estimate the conditional expectation of a response variable taking into account the hierarchical data structure, but they are not able to characterize the entire conditional distribution of a dependent variable. Quantile regression models do allow this but are unable to deal with hierarchical data. Geraci and Bottai (2007, 2013) have introduced a new method for quantile regression with mixed effects, the "Linear Quantile Mixed Model" (LQMM) which, in this context, we call "Multilevel Linear Quantile Regression" (MLQR). They propose a conditional quantile regression model for continuous responses where random effects are added to the model taking into account the dependence between units when hierarchical data structure is present. We have adopted the procedure proposed by Geraci and Bottai to perform a multilevel quantile regression model at individual and family level.

Seven quantile estimations are fixed for each model: 0.10, 0.25, 0.33, 0.50, 0.67, 0.75 and 0.90. Independent variables considered in our models are: age, gender, employment status; education, disability, chronic condition (18 chronic diseases present/absent), body mass index and physical activity, which are considered at individual level; household typology and household economic resources are included at household level. Urban degree was insert as a contextual independent variable.

Results and discussion. A more detailed analysis of the conditional distribution of the response on other quantiles highlighted a differential effect of some covariates along the distribution, in particular the disability, some acute diseases (arthritis, cancer and infarct for PCS; depression, Alzheimer, and cancer for MCS and physical activities. Multilevel Quantile Models represent a valid alternative in case of skewness and heteroschedasticity problems and provide a more complete picture of the relation between covariates and outcomes.