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A multilevel analysis of life satisfaction in Central and Eastern Europe

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Abstract

The existence of data hierarchies is neither accidental nor ignorable. Both the group and its members influence and are influenced by the group membership. Ignoring this relationship may lead to ignoring group effects and hence to invalidating many of the traditional techniques of statistical analysis used to investigate the relationships between data. People living within the same country may be more similar to each other than people living in other countries; they share the country economic characteristics, lifestyle, social factors, and health care availability, which may have a collective influence over and above individual circumstances. The degree of satisfaction with life may be determined by factors that may be shaped by the specific country environment. The ability to model such complex relationships comes at a computational cost. Each multi-level software package has a different interface and different capabilities; therefore the choice of which to use is important. Using R and SPSS we develop a multilevel analysis of the level of satisfaction with life in general of individuals from Central and Eastern Europe that are grouped within countries. Our analysis looks at life satisfaction data and discusses the possible influence of country and/ or individual factors.

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Keywords: life satisfaction, multilevel model, multilevel analysis, maximum likelihood estimation

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1. Introduction

Many kinds of data have a hierarchical or clustered structure. The existence of such data hierarchies is neither accidental nor ignorable [6]. Both the group and its members influence and are influenced by the group membership. Ignoring this relationship may lead to ignoring group effects and hence to invalidating many of the traditional techniques of statistical analysis used to investigate the relationships between data. To ignore this relationship risks overlooking the importance of group effects, and may also render invalid many of the traditional statistical analysis techniques used for studying data relationships.

Multilevel regression model assumes that the data is hierarchical, with the response variable measured at the lowest level, and explanatory variables measured at all existing levels.

2. Statistical software for multilevel analysis

The ability to model more complex relationships comes at a computational cost [8]. The more complex models can easily bog down, fail to converge on a solution, or yield questionable results. Multilevel models are more data demanding in that adequate sample sizes at several levels may be required to ensure sufficient power to detect effects; as a result, the models can become quite complicated, difficult to estimate, and even more difficult to interpret [8]. These types of "exploratory" models are usually even more difficult to estimate with categorical outcomes than with continuous outcomes.

Each multi-level package has a different interface and different capabilities; therefore the choice of which to use is important [16]. Our data is modelled with SPSS and R, two of the general statistical packages capable of performing multilevel analyses.

Estimation of the variance components is an important issue. In the case of continuous y, most statistical software proceed in the classical manner using either full maximum likelihood (FML) or, more commonly, restricted maximum likelihood (REML) methods for the normal model. REML estimation method is usually the default method in most packages. Both FML and REML produce identical fixed effects estimates, but REML produces variance components estimates that are less biased. In small samples with balanced data, REML is generally preferable to FML because it is unbiased. In large samples, however, differences between estimates are neglible (Snijders and Bosker, 1999 in [2]).

R is a free open-source statistics software, excellent for graphics, classical statistical modelling, and various nonparametric methods, as well as for many multilevel models. Beyond the specific models that can be fit by the existing R packages, this program is fully programmable and can thus fit any model, if enough programming is done. R contains multiple packages that estimate multilevel models: the nlme and lme4; lme4 [3] is particularly valuable in dealing with non-normally distributed outcomes and partially crossed data structures.

The SPSS commands of interest for multilevel modelling are all contained in the Advanced Models module, these being MIXED and VARCOMP. The MIXED procedure can be used to fit a variety of mixed linear models, including multilevel models. It provides estimates of the regression coefficients as well as of the variance components. SPSS has some limitations such as the exclusive use of the Wald test for testing the variance parameters (Hayes, 2006: 386).

3. Analysis of life satisfaction data

People living within the same country may be more similar to each other than people living in other countries; they share country's economic characteristics, lifestyle, social factors and health care availability, which may have a collective influence over and above individual circumstances. The degree of satisfaction with life may be determined by factors such as the individual respondents' characteristics (age, gender, marital status) as well as the degree of satisfaction with their health that may be shaped by the specific country environment.

The data for this example is a subsample from the 76.2 Eurobarometer [5] database carried out in September-November 2011. The subsample used in the present analysis includes responses of 8067 individuals nested within 8 countries in Central and Eastern Europe - Bulgaria, Czech Republic, Poland, Romania, Slovakia, Slovenia, Croatia, Republic of Macedonia. Such nesting is a standard feature of multilevel data: each individual nested under the same