**Appendix A**

We estimate models assuming independent observations following the density given by

where is the standard normal density, is the standard normal cumulative distribution function, and *d* is an indicator variable equal to one if and zero otherwise. In some models the mixture probabilities are allowed to be a function of covariates ***z***, which may be different from the covariates ***x*** used to model the means corresponding to the Tobit components. The mixture probabilities are modelled by

where . To apply (1) and (2) to the EQ-5D preference index, we define *y* = 1- EQ-5D.

 We wrote a Stata command called ZICEN (zero-inflated censored normals) to maximize the likelihood function. ZICEN estimates models with- and without covariates in the mixture probabilities, assuming either one or two Tobit components. To install the command, enter ssc install zicen in Stata’s command prompt (an Internet connection is required). For details on the syntax, type help zicen. It is possible to use different maximization methods, which can be specified with the option technique (the default is the Newton-Raphson algorithm). We recommend the use of the option difficult. The difficult option varies how a direction is found when the negative Hessian cannot be inverted. Stata flags such instances with a message indicating that the likelihood is “not concave.” (36)

*Starting values*

In many cases the likelihood function of a mixture model is difficult to maximize because of the possibility of multiple local maxima and non-concave regions. To ameliorate this problem, we developed an algorithm for choosing starting values. We tested our algorithm with extensive simulations. This strategy proved to be effective in that estimated parameters converged to their true values.

1) **Null model**: Starting values for the null model (a model without covariates ***x*** or ***z***) are based on the distribution of the observed outcome variable *y*. A null model with one degenerate component and two Tobit components requires six starting values: two mixture probabilities, two standard deviations, and two means for the Tobit components. Let *p0* be the proportion of observed values where *y* = 0. The starting values for the two mixture probabilities corresponding to the two Tobit components are given by

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That is, we assume that the Tobit components are mixed with equal probability. The logit transformation is necessary because ZICEN models the log odds (logit) rather than the probabilities. Next, we divide observations with y > 0 in half using the median as the cutting point. For each half, the observed median and natural logarithm of the standard deviation are the starting values for the mean and standard deviation of each of the Tobit components, respectively.

2) **Models with no covariates in the mixture probabilities**. ZICEN first estimates a null model as in 1) and uses the estimated parameters of the null model as starting values for models with covariates ***x***. This is similar to the strategy followed by most of Stata’s estimation commands. The likelihood ratio test comparing the null and current model is reported.

3) **Models with covariates in the mixture probabilities**. For models with covariates ***z*** in the mixture probabilities, ZICEN first estimates the null model as in 1) and then it estimates a model with only covariates ***x*** as in 2). The estimated parameters from step 2) are then used as starting values for a model with covariates ***z***.

*Other starting values*

In some cases, our strategy for choosing starting values may not be appropriate. The auxiliary command zicen0 allows the user to enter starting values. See ZICEN’s help file for examples.