Memorandum 2

King et al.’s advice bounded and/or asymmetrical variables are transformed to approximate unbounded or, at least more symmetrical, variables before imputation. After imputation the transformations are inverted. Integer-valued variables are either rounded to the nearest integer or, in some cases, the inverted value is used to set the probabilities of a uniform bivariate random distribution from which the imputed value is drawn. The transformations for each variable are described below, where \( x \) is the original variable and \( t \) is the transformed variable. The operator \( \log(\cdot) \) refers to the natural logarithm. Variable numbers refer to column A in the table of variable definitions in Appendix 3.

A. Transformation: \( t = \log\left(\frac{x + 0.1}{1.01 - x}\right) \).
   Inverse transformation: Rounds to nearest integer, except 12 [drawn from random distribution].
   Variables: 1, 3, 4, 5, 7, 8, 12, 23, 25, 26, 27, 29, 30, 31, 34, 35, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 64.

B. Transformation: \( t = \log\left(\frac{x/n + 1/(2n)}{1 + 1/(2n) - (x/n)}\right) \), where \( n \) is the maximum value of a 0 to \( n \) scale.
   Inverse transformation: Rounds to nearest integer.
   Variables: 2, 21, 22, 24.

C. Transformation: \( t = \log(x) \).
   Variables: 6, 9, 13, 14, 15 [\( x \) is replaced by \( 1 + x \)], 16, 17, 18, 28, 60, 62.

D. Transformation: \( t = \sqrt{x} \).
   Variables: 32, 33.

Transformations A and B are logit transformations with Cox’s modification to allow for the fact the logit is not defined at the endpoints on the 0-1 interval (see Amemiya 1985, pp. 277-278). Once passed through the inverse transformation, imputed variables may sometimes lie outside the endpoints of the original scale. In these cases, the imputed variable is set to the nearest endpoint.