The theory of Muckenhoupt weights arises in many areas of analysis, for example in connection with bounds for singular integrals and maximal functions on weighted spaces. We show that a certain averaging process gives a method for constructing $A_p$ weights from a measurably varying family of dyadic $A_p$ weights. This averaging process is suggested by the exponential/logarithmic relationship between the $A_p$ weight class and the space $BMO$ of functions of bounded mean oscillation. The same averaging process also constructs weights satisfying the reverse Hölder ($RH_p$) condition from families of dyadic $RH_p$ weights. Moreover, it applies to the multiparameter weight classes $A_p$ and $RH_p$ on the polydisc as well. (Received February 03, 2010)