Analysis is made of the accuracy of magnetic observatory hourly means constructed from definitive minute data having missing values (gaps). Bootstrap sampling from different data-gap distributions is used to estimate average errors on hourly means as a function of the number of missing data. Absolute and relative error results are calculated for horizontal-intensity, declination, and vertical-component data collected at high, medium, and low magnetic latitudes. For 90% complete coverage (10% missing data), average (RMS) absolute errors on hourly means are generally less than errors permitted by Intermagnet for minute data. As a rule of thumb, the average relative error for hourly means with 10% missing minute data is approximately equal to 10% of the hourly standard deviation of the source minute data.