Gravitational wave detectors are now making it possible to measure how the merger rate of binary black holes (BBHs) evolves with redshift (z). We examine whether the BBH merger rate of isolated binaries deviates from the scaled star formation rate density (SFRD)---a frequently used model in state-of-the-art research. To address this question, we conduct population synthesis simulations using COMPAS with a grid of stellar evolution models and compare the simulated merger rate from each model to the scaled SFRD. We find that our simulated rates deviate from a scaled SFRD due to two main phenomena: (i) the formation efficiency of BBHs is an order of magnitude higher at low metallicities than at solar metallicity, and (ii) BBHs experience delays from formation to merger ranging from Myrs to Gyrs. Combined, these effects cause our simulated BBH merger rates to deviate from the SFRD with factors up to 3.5x at z = 0 and 5x at z~9. Deviations are similar when comparing to a *delayed* SFRD, and even larger (up to ~10x) when the SFRD is scaled to the local merger rate. Interestingly, the BBH delay time distribution is redshift-dependent in our simulations, increasing the complexity of delay time effects on the merger rate redshift evolution. Our work motivates a movement away from SFRD-based merger rate models, and shows exactly how future measurements of the merger throughout redshift will offer insight into the channels the form gravitational wave sources.