We present a numerical design optimization of step-index ZBLAN fibers for developing mid-infrared (IR) supercontinuum sources with spectra covering the 1–4.5 μm regime using direct pumping with 10 ps pulses (FWHM) from mode-locked Yb (12.5 kW peak power) and Er lasers (10 kW peak power). Even with optimum NA and core diameter to minimize confinement loss and give the most suitable dispersion and nonlinearity, the Yb pump-laser cannot push the spectrum beyond 1.52 μm, whereas the Er laser can push the spectrum to 4.15 μm. We further consider the optimum placement of a 20 cm taper to broaden the spectrum. This does not considerably broaden the Yb-pumped spectrum, whereas the Er-pumped spectrum can be extended to 4.5 μm through mid-IR dispersive waves and tunneling solitons.