**Figure S1.** (A)MV4-11 cells were treated for 24 h with ABT-199 and then 5 x 105 cells were subjected to the JC-1 assay. \*\*indicates p<0.005. (B) MV4-11 cells were treated for 24 h. Whole cell lysates were subjected to Western blotting and probed with the indicated antibody. (C) MV4-11 cells were treated with ABT-199 for 24 h. Immunoprecipitation of Bim from whole cell lysates was performed and subjected to Western blotting and probed with anti-Bim or -Bcl-2 antibody. (D) AML1015 cells were treated for 24 h with ABT-199 and then 5 x 105 cells were subjected to the JC-1 assay. \*\*indicates p<0.005. (E) AML1015 cells were treated with ABT-199 for 24 h. Whole cell lysates were subjected to Western blotting and probed with the indicated antibody. (F) AML1015 cells were treated with ABT-199 for 24 h. Immunoprecipitation of Bim from whole cell lysates was performed and subjected to Western blotting and probed with anti-Bim or -Bcl-2 antibody. \*indicates light chain of the Bim antibody.

**Figure S2.** U937 cells were treated with MG-132 for 24 h and subjected to trypan blue counting. Results are graphed as mean percent trypan blue negative ± s.e.m.

**Figure S3.** (A) *Ex vivo* ABT-199 sensitivity was determined using MTT assays. The horizontal lines indicate median ABT-199 IC50s in each group of AML patient samples. (B) Total RNA was isolated and gene transcript levels were determined by real-time RT-PCR. Transcript levels were normalized to glyceraldehyde 3-phosphate dehydrogenase (GAPDH) and relative expression levels were calculated using the comparative *Ct* method (comparing all samples to the CMS cell line expression levels). The Bcl-2/Mcl-1 ratio is plotted against the ABT-199 IC50. (C) Based on the median ABT-199 IC50, AML patient samples were divided into two groups and graphed versus the Bcl-2/Mcl-1 ratio. (D) AML patient sample IC50s are graphed. The horizontal line indicates median.