In addition to the HLA locus, six genetic risk factors for primary biliary cirrhosis (PBC) have been identified in recent genome-wide association studies (GWAS). To identify additional loci, we carried out a GWAS using 1,840 cases from the UK PBC Consortium and 5,163 UK population controls as part of the Wellcome Trust Case Control Consortium 3 (WTCCC3). We followed up 28 loci in an additional UK cohort of 620 PBC cases and 2,514 population controls. We identified 12 new susceptibility loci (at a genome-wide significance level of $P < 5 \times 10^{-8}$) and replicated all previously associated loci. We identified three further new loci in a meta-analysis of data from our study and previously published GWAS results. New candidate genes include STAT4, DENND1B, CD80, IL7R, CXCR5, TNFRSF1A, CLEC16A and NFKB1. This study has considerably expanded our knowledge of the genetic architecture of PBC.