1019-42-14        **Ryan Berndt\*** (`berndt@math.ohio-state.edu`), Mathematics Department, Cardwell Hall, Manhattan, KS 66506. *Unbounded singular integral operators, weighted Hardy spaces, and $A_p$ weights.*

We examine singular integrals of the form

$$Tf(x) = \lim_{\epsilon \to 0} \int_{|y| \geq \epsilon} \frac{B(y)}{y} f(x - y) \, dy$$

where the function $B$ is non-negative and even, and is allowed to have singularities at zero and infinity. The operators we consider are not generally bounded on $L^2(\mathbf{R})$, yet there is a Hardy space theory for them. For each $T$ there are associated atomic Hardy spaces, called $H_B^1$ and $H_B^{1,1}$. The atoms of both spaces possess a size condition involving $B$. The operator $T$ maps $H_B^{1,1}$ and certain $H_B^1$ continuously into $H^1 \subset L^1$. We also discuss the connection these Hardy spaces have to the weighted Hardy spaces of Garcia-Cuerva via the theory of $A_p$ weights. (Received June 19, 2006)