ATbounds: An R vignette using the Right Heart Catheterization Dataset

```
library(ATbounds)
```

Right Heart Catheterization Dataset

In this vignette, we revisit the well-known Right Heart Catheterization Dataset available at Vanderbilt Biostatistics Datasets Page. A cleaned version of the dataset is available in the package.

```
  Y <- RHC[,"survival"]
  D <- RHC[,"RHC"]
  X <- RHC[,-c(1,2)]
```

Bounding the Average Treatment Effect

We take the reference propensity score to be $\widehat{p}_{\text{RPS}}(X_i) = n^{-1}\sum_{i=1}^{n} D_i$ for each observation i. That is, we assign the sample proportion of the treated to the reference propensity scores uniformly for all observations. Of course, this is likely to be misspecified; however, it has the advantage that $1/\widehat{p}_{\text{RPS}}(X_i)$ is never close to 0 or 1.

```
  rps <- rep(mean(D),length(D))
```

We start with $Q = 1$.

```
  summary(atebounds(Y, D, X, rps, Q = 1))
#> ATbounds: ATE
#> Call: atebounds(Y = Y, D = D, X = X, rps = rps, Q = 1)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate           -0.47742     0.48753
#> Confidence Interval      -0.54972     0.55664
```

We now consider $Q = 2$

```
  summary(atebounds(Y, D, X, rps, Q = 2))
#> ATbounds: ATE
#> Call: atebounds(Y = Y, D = D, X = X, rps = rps, Q = 2)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate           -0.17275    0.018032
#> Confidence Interval      -0.21518    0.063421
```

and $Q = 3$.

```
  summary(atebounds(Y, D, X, rps, Q = 3))
#> ATbounds: ATE
#> Call: atebounds(Y = Y, D = D, X = X, rps = rps, Q = 3)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate           -0.11213   -0.058280
#> Confidence Interval      -0.14658   -0.022432
```

Finally, we take $Q = 4$.

```
  summary(atebounds(Y, D, X, rps, Q = 4))
#> ATbounds: ATE
#> Call: atebounds(Y = Y, D = D, X = X, rps = rps, Q = 4)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate         -0.083816   -0.122172
#> Confidence Interval    -0.143475   -0.057158
```

Bounding the Average Treatment Effect on the Treated

We now look at ATT with a few values of Q.

```
  summary(attbounds(Y, D, X, rps, Q = 2))
#> ATbounds: ATT
#> Call: attbounds(Y = Y, D = D, X = X, rps = rps, Q = 2)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate           -0.16859    0.003702
#> Confidence Interval      -0.21617    0.038830
  summary(attbounds(Y, D, X, rps, Q = 3))
#> ATbounds: ATT
#> Call: attbounds(Y = Y, D = D, X = X, rps = rps, Q = 3)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate         -0.077412   -0.039280
#> Confidence Interval    -0.116903   -0.006371
  summary(attbounds(Y, D, X, rps, Q = 4))
#> ATbounds: ATT
#> Call: attbounds(Y = Y, D = D, X = X, rps = rps, Q = 4)
#> Confidence Level: 0.95
#>                      Lower_Bound Upper_Bound
#> Bound Estimate         -0.048803   -0.057035
#> Confidence Interval    -0.090023   -0.016366
```