GXT and CVD; initial results

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**Table** Inclusion criteria for the current study

**Question**: Should we drop the last exclusion given our focus is on all cause mortality?

| Exclusion criteria | Number of participants |
| --- | --- |
| CARDIA participants enrolled at Year 0 exam | 5,114 |
| Completed at least one graded exercise test | 5,079 |
| Not using beta blockers during graded exercise test | 5,062 |
| Alive and CVD free at Year 20 exam | 4,805 |

**Table** Participant characteristics at the Year 0 Exam.

| **Characteristic** | **Overall** | **Black Females** | **Black Males** | **White Females** | **White Males** | **p-value1** |
| --- | --- | --- | --- | --- | --- | --- |
| No. of participants | 4,781 | 1,387 | 1,040 | 1,268 | 1,086 |  |
| Testing center |  |  |  |  |  | <0.001 |
| Birmingham | 22 | 24 | 25 | 19 | 22 |  |
| Chicago | 22 | 22 | 21 | 22 | 24 |  |
| Minnesota | 28 | 21 | 26 | 31 | 32 |  |
| Oakland | 28 | 33 | 28 | 28 | 22 |  |
| Age | 24.8 (3.7) | 24.3 (3.8) | 24.0 (3.7) | 25.4 (3.4) | 25.3 (3.4) | <0.001 |
| GXT duration, seconds | 581 (183) | 428 (124) | 666 (153) | 550 (144) | 729 (147) | <0.001 |
| Education at year 20 |  |  |  |  |  | <0.001 |
| Associate's or more | 33 | 20 | 18 | 48 | 46 |  |
| Highschool/GED or less | 67 | 80 | 82 | 52 | 54 |  |
| Difficulty paying for basics |  |  |  |  |  | <0.001 |
| Not very hard | 66 | 62 | 61 | 68 | 74 |  |
| Somewhat hard | 34 | 38 | 39 | 32 | 26 |  |
| Marital status |  |  |  |  |  | <0.001 |
| Married or co-habitating | 22 | 19 | 18 | 28 | 22 |  |
| Other | 78 | 81 | 82 | 72 | 78 |  |
| Body mass index, kg/m2 | 24.4 (4.9) | 25.7 (6.4) | 24.5 (4.2) | 23.1 (4.3) | 24.3 (3.5) | <0.001 |
| Self-reported physical activity |  |  |  |  |  | <0.001 |
| Meeting guidelines | 59 | 37 | 73 | 58 | 73 |  |
| Not meeting guidelines | 41 | 63 | 27 | 42 | 27 |  |
| Self-reported health |  |  |  |  |  | <0.001 |
| Excellent or good | 90 | 85 | 89 | 94 | 94 |  |
| Fair or poor | 9.9 | 15 | 11 | 6.0 | 6.0 |  |
| Alcohol use |  |  |  |  |  | <0.001 |
| Does not drink alcohol | 14 | 21 | 15 | 9.4 | 8.0 |  |
| Drinks alcohol | 86 | 79 | 85 | 91 | 92 |  |
| Smoking status |  |  |  |  |  | <0.001 |
| Current | 30 | 31 | 36 | 27 | 25 |  |
| Former | 13 | 8.4 | 9.1 | 20 | 16 |  |
| Never smoked | 57 | 60 | 55 | 53 | 59 |  |
| *1Kruskal-Wallis rank sum test; Pearson's Chi-squared test* | | | | | | |

**Table** Participant characteristics at the Year 20 Exam.

| **Characteristic** | **Overall** | **Black Females** | **Black Males** | **White Females** | **White Males** | **p-value1** |
| --- | --- | --- | --- | --- | --- | --- |
| No. of participants | 4,631 | 1,322 | 1,006 | 1,238 | 1,065 |  |
| Testing center |  |  |  |  |  | <0.001 |
| Birmingham | 22 | 23 | 25 | 19 | 22 |  |
| Chicago | 22 | 22 | 21 | 22 | 24 |  |
| Minnesota | 28 | 22 | 26 | 32 | 32 |  |
| Oakland | 28 | 33 | 28 | 27 | 22 |  |
| Age | 44.8 (3.7) | 44.3 (3.8) | 44.0 (3.7) | 45.5 (3.4) | 45.4 (3.4) | <0.001 |
| GXT duration, seconds | 433 (160) | 299 (111) | 461 (130) | 429 (141) | 555 (135) | <0.001 |
| Education at year 20 |  |  |  |  |  | <0.001 |
| Associate's or more | 64 | 53 | 44 | 77 | 73 |  |
| Highschool/GED or less | 36 | 47 | 56 | 23 | 27 |  |
| Difficulty paying for basics |  |  |  |  |  | <0.001 |
| Not very hard | 76 | 64 | 72 | 81 | 85 |  |
| Somewhat hard | 24 | 36 | 28 | 19 | 15 |  |
| Marital status |  |  |  |  |  | <0.001 |
| Married or co-habitating | 56 | 40 | 50 | 67 | 67 |  |
| Other | 44 | 60 | 50 | 33 | 33 |  |
| Body mass index, kg/m2 | 29 (7) | 32 (8) | 29 (6) | 27 (7) | 28 (5) | <0.001 |
| Self-reported physical activity |  |  |  |  |  | <0.001 |
| Meeting guidelines | 48 | 29 | 55 | 48 | 61 |  |
| Not meeting guidelines | 52 | 71 | 45 | 52 | 39 |  |
| Self-reported health |  |  |  |  |  | <0.001 |
| Excellent or good | 90 | 83 | 87 | 94 | 94 |  |
| Fair or poor | 10 | 17 | 13 | 6.0 | 6.3 |  |
| Alcohol use |  |  |  |  |  | <0.001 |
| Does not drink alcohol | 21 | 30 | 26 | 14 | 14 |  |
| Drinks alcohol | 79 | 70 | 74 | 86 | 86 |  |
| Smoking status |  |  |  |  |  | <0.001 |
| Current | 19 | 23 | 29 | 13 | 16 |  |
| Former | 19 | 12 | 11 | 28 | 21 |  |
| Never smoked | 62 | 64 | 60 | 58 | 64 |  |
| *1Kruskal-Wallis rank sum test; Pearson's Chi-squared test* | | | | | | |

**Table**: Hazard ratio (95%) for all-cause mortality among CARDIA participants in the current analysis.

|  | **Hazard ratio (95% CI)1** | | | **P-value for interaction2** | |
| --- | --- | --- | --- | --- | --- |
| **Characteristic** | **Model 1** | **Model 2a** | **Model 2b** | **Race** | **Sex** |
| Continuous | | | | | |
| GXT duration,  per 1 minute |  |  |  |  |  |
| GXT % decline,  per 5% |  |  |  |  |  |
| *GXT duration, Y0* | | | | | |
| ≥ 12 minutes | 1 (ref) | 1 (ref) | 1 (ref) | .02 | .41 |
| ≥ 8 to < 12 minutes | 1.47 (0.96, 2.23) | 1.38 (0.91, 2.10) | 1.34 (0.88, 2.05) |
| < 8 minutes | 2.51 (1.48, 4.28) | 2.39 (1.38, 4.14) | 2.27 (1.28, 4.00) |
| *20-year % reduction in GXT duration* | | | | | |
| < 25% decline | 1 (ref) | 1 (ref) | 1 (ref) | .09 | .67 |
| ≥ 25% to < 35% decline | 1.41 (0.89, 2.22) | 1.39 (0.86, 2.25) | 1.32 (0.83, 2.12) |
| ≥ 35% decline | 1.60 (0.97, 2.63) | 1.66 (0.96, 2.86) | 1.51 (0.89, 2.56) |
| 1Model 1 adjusts for CARDIA center, race, sex, education, and age. Model 2a adjusts for variables in model 1 plus body mass index, smoking status, and self reported physical activity and health. Model 2b adjusts for variables in model 1 plus the estimated number of years after Year 0 where paying for basics was somewhat hard, highest degree obtained was high school graduate or general education degree, self reported health was fair or poor, the participant reported smoking or drinking alcohol, body mass index was in the obese or overweight range, and self-reported physical activity did not meet guidelines. | | | | | |
| 2P-values were computed adjusting for variables in Model 2b, using the large-sample test from multiply imputed data described by Li, Raghunathan, & Rubin, 1991. | | | | | |
| CI represents confidence interval; GXT graded exercise test; Y0 Year 0 | | | | | |

|  | **Hazard ratio (95% CI)1** | | | **P-value for interaction2** | |
| --- | --- | --- | --- | --- | --- |
| **Characteristic** | **Model 1** | **Model 2a** | **Model 2b** | **Race** | **Sex** |
| *GXT duration, Y0* | | | | | |
| ≥ 12 minutes | 1 (ref) | 1 (ref) | 1 (ref) | .58 | .17 |
| ≥ 8 to < 12 minutes | 1.51 (0.99, 2.31) | 1.46 (0.95, 2.24) | 1.24 (0.80, 1.91) |
| < 8 minutes | 2.05 (1.15, 3.64) | 1.92 (1.07, 3.47) | 1.37 (0.75, 2.50) |
| *20-year % reduction in GXT duration* | | | | | |
| < 25% decline | 1 (ref) | 1 (ref) | 1 (ref) | .41 | .06 |
| ≥ 25% to < 35% decline | 1.83 (1.07, 3.14) | 1.77 (1.01, 3.11) | 1.49 (0.86, 2.57) |
| ≥ 35% decline | 2.73 (1.49, 5.03) | 2.57 (1.30, 5.08) | 1.96 (1.02, 3.76) |
| 1Model 1 adjusts for CARDIA center, race, sex, education, and age. Model 2a adjusts for variables in model 1 plus body mass index, smoking status, and self reported physical activity and health. Model 2b adjusts for variables in model 1 plus the estimated number of years after Year 0 where paying for basics was somewhat hard, highest degree obtained was high school graduate or general education degree, self reported health was fair or poor, the participant reported smoking or drinking alcohol, body mass index was in the obese or overweight range, and self-reported physical activity did not meet guidelines. | | | | | |
| 2P-values were computed adjusting for variables in Model 2b, using the large-sample test from multiply imputed data described by Li, Raghunathan, & Rubin, 1991. | | | | | |
| CI represents confidence interval; GXT graded exercise test; Y0 Year 0 | | | | | |

# Reproducibility

Reproducibility receipt

## [1] "2021-11-15 10:58:06 EST"

## Local: master D:/CARDIA - GXT and CVD  
## Remote: master @ origin (https://github.com/bcjaeger/CARDIA---GXT-and-CVD.git)  
## Head: [7354fc1] 2021-11-12: categorical exposures make better tables

## R version 4.1.1 (2021-08-10)  
## Platform: x86\_64-w64-mingw32/x64 (64-bit)  
## Running under: Windows 10 x64 (build 19043)  
##   
## Matrix products: default  
##   
## locale:  
## [1] LC\_COLLATE=English\_U.S. Virgin Islands.1252   
## [2] LC\_CTYPE=English\_U.S. Virgin Islands.1252   
## [3] LC\_MONETARY=English\_U.S. Virgin Islands.1252  
## [4] LC\_NUMERIC=C   
## [5] LC\_TIME=English\_U.S. Virgin Islands.1252   
##   
## attached base packages:  
## [1] stats graphics grDevices utils datasets methods base   
##   
## other attached packages:  
## [1] gtsummary\_1.5.0 table.glue\_0.0.2 mitml\_0.4-3 survminer\_0.4.9   
## [5] ggpubr\_0.4.0 cmprsk\_2.2-10 survival\_3.2-11 recipes\_0.1.17   
## [9] miceRanger\_1.5.0 lme4\_1.1-27.1 Matrix\_1.3-4 haven\_2.4.3   
## [13] tidylog\_1.0.2 forcats\_0.5.1 stringr\_1.4.0 dplyr\_1.0.7   
## [17] purrr\_0.3.4 readr\_2.0.2 tidyr\_1.1.4 tibble\_3.1.5   
## [21] ggplot2\_3.3.5 tidyverse\_1.3.1 flextable\_0.6.9 tarchetypes\_0.3.2  
## [25] targets\_0.8.1 dotenv\_1.0.3 conflicted\_1.0.4   
##   
## loaded via a namespace (and not attached):  
## [1] readxl\_1.3.1 uuid\_1.0-2 backports\_1.3.0   
## [4] corrplot\_0.90 systemfonts\_1.0.3 igraph\_1.2.7   
## [7] splines\_4.1.1 listenv\_0.8.0 digest\_0.6.28   
## [10] foreach\_1.5.1 htmltools\_0.5.2 fansi\_0.5.0   
## [13] memoise\_2.0.0 magrittr\_2.0.1 tzdb\_0.2.0   
## [16] openxlsx\_4.2.4 globals\_0.14.0 modelr\_0.1.8   
## [19] gower\_0.2.2 officer\_0.4.0 colorspace\_2.0-2   
## [22] rvest\_1.0.2 pan\_1.6 xfun\_0.27   
## [25] callr\_3.7.0 crayon\_1.4.1 jsonlite\_1.7.2   
## [28] officedown\_0.2.2 Exact\_3.0 zoo\_1.8-9   
## [31] iterators\_1.0.13 glue\_1.4.2 rvg\_0.2.5   
## [34] gtable\_0.3.0 ipred\_0.9-12 car\_3.0-11   
## [37] future.apply\_1.8.1 jomo\_2.7-2 abind\_1.4-5   
## [40] scales\_1.1.1 mvtnorm\_1.1-3 DBI\_1.1.1   
## [43] rstatix\_0.7.0 Rcpp\_1.0.7 xtable\_1.8-4   
## [46] foreign\_0.8-81 proxy\_0.4-26 km.ci\_0.5-2   
## [49] clisymbols\_1.2.0 lava\_1.6.10 prodlim\_2019.11.13   
## [52] httr\_1.4.2 FNN\_1.1.3 ellipsis\_0.3.2   
## [55] pkgconfig\_2.0.3 nnet\_7.3-16 dbplyr\_2.1.1   
## [58] utf8\_1.2.2 tidyselect\_1.1.1 rlang\_0.4.12   
## [61] munsell\_0.5.0 cellranger\_1.1.0 tools\_4.1.1   
## [64] cachem\_1.0.6 cli\_3.0.1 generics\_0.1.1   
## [67] ranger\_0.13.1 broom\_0.7.9 evaluate\_0.14   
## [70] fastmap\_1.1.0 yaml\_2.2.1 processx\_3.5.2   
## [73] knitr\_1.36 fs\_1.5.0 zip\_2.2.0   
## [76] survMisc\_0.5.5 rootSolve\_1.8.2.3 future\_1.22.1   
## [79] nlme\_3.1-152 xml2\_1.3.2 compiler\_4.1.1   
## [82] rstudioapi\_0.13 curl\_4.3.2 e1071\_1.7-9   
## [85] ggsignif\_0.6.3 gt\_0.3.1 reprex\_2.0.1   
## [88] broom.helpers\_1.4.0 DescTools\_0.99.43 stringi\_1.7.5   
## [91] ps\_1.6.0 gdtools\_0.2.3 lattice\_0.20-44   
## [94] nloptr\_1.2.2.2 KMsurv\_0.1-5 vctrs\_0.3.8   
## [97] pillar\_1.6.4 lifecycle\_1.0.1 data.table\_1.14.2   
## [100] lmom\_2.8 R6\_2.5.1 gridExtra\_2.3   
## [103] rio\_0.5.27 parallelly\_1.28.1 gld\_2.6.2   
## [106] codetools\_0.2-18 boot\_1.3-28 MASS\_7.3-54   
## [109] assertthat\_0.2.1 withr\_2.4.2 expm\_0.999-6   
## [112] parallel\_4.1.1 hms\_1.1.1 grid\_4.1.1   
## [115] rpart\_4.1-15 timeDate\_3043.102 class\_7.3-19   
## [118] minqa\_1.2.4 rmarkdown\_2.11 carData\_3.0-4   
## [121] git2r\_0.28.0 lubridate\_1.8.0 base64enc\_0.1-3