WEB MATERIAL

Supplement to:
Kramer MR, Valderrama A, Casper M. Decomposing black-white disparities in heart disease mortality in the U.S.: an age-period-cohort analysis. *American Journal of Epidemiology* 2015.

Web Appendix

Constrained Poisson regression

We first estimated nested Poisson regression models within each race-sex group, testing for improved fit with the addition of each time scale (Table 2 in main manuscript). To estimate race- and sex-specific age, period, and cohort effects within a single regression framework we fit a 3-factor constrained Poisson regression model including main effects for race-sex group and for age, period, and cohort indicator variables, along with race-sex interactions with each of the three time scales. The interaction age, period, cohort model is represented here:

$$\ln(Y_{ijkm}) = \alpha_0 + \alpha_m + \beta_i + \gamma_j + \delta_k + \tau_{im} + \varphi_{jm} + \omega_{km} + \ln(POP_{ijkm}) + e_{ijkm}$$

Where *m* indexes race-sex groups (*m*=1, 2, 3 with 4th group – white men – as referent), and α_m are the main effects of race-sex group, β_i is the ith of I-1 age category parameters, γ_j is the jth of J-1 period parameters, δ_k is the kth of I+J–2 cohort parameters. The interaction terms allow for heterogeneity in age, period, or cohort effects by race or sex. τ_{im} is the vector of parameters for the interaction between race-sex group and age categories; φ_{jm} is the vector of parameters for the interaction between race-sex groups and period categories; and ω_{km} is the vector of parameters for the interaction between race-sex groups and cohort categories. Y_{ijkm} is the count of deaths in each category, and $\ln(POP_{ijkm})$ is the log-offset for population at risk in each category, e_{ijkm} is the group-specific error.

To make the model identifiable, we constrained the first 2 period categories (1973-1977 and 1978-1982) such that $\gamma_1 = \gamma_2 = 0$. Likelihood ratio tests of each set of interaction terms supported significant interaction between race-sex membership and each of the three time scales ($P<0.001$ in all cases) (1).

Intrinsic estimator

The intrinsic estimator weights the design matrix to address collinearity between the three sets of predictors of age, period, and cohort (2). It yields a unique solution determined by the Moore-Penrose inverse (3) and is an unbiased estimator which may have greater statistical efficiency than the traditional constrained-coefficient model commonly employed (4, 5). Although the under-identification of APC models is not eliminated by this method, simulation studies suggest that the intrinsic estimator recovers independent effects more efficiently than other approaches (2). Important critiques have also been raised about the method. For instance Luo argues that the constraint assumptions of the intrinsic estimator may be different, but not necessarily better than other arbitrary choices, and as a result may still produce biased estimates (6).

The method for calculating the intrinsic estimator has been described in detail elsewhere (2). Models are fit separately for each race and sex specific strata. Briefly, the data are arranged with a row for every unique combination of age-group and period with indicator variables for age, period, and cohort group membership. Then the age-period specific counts of heart disease death are regressed on eigenvector design matrix in a Poisson regression model with the natural log of the population at risk as an offset. The resulting coefficients are transformed back to their original scale.

The resulting intrinsic estimator coefficients are constrained to sum to zero, with the magnitude and trends in the coefficients interpreted as the difference among members of a given time period as compared with the mean race- and sex-specific rate. For example, considering the period time-scale as the predictor, the null hypothesis is that coefficients for all periods are zero, indicating that conditional on age and birth cohort, heart disease mortality rates were equal to the baseline rate—the intercept—for every year of observation (e.g. 1973-2010). (2) Non-zero coefficients (or rate ratios departing from the null value of 1.0) suggest relatively higher or lower rates in a given year as compared to the overall mean, conditional on age and birth cohort. Interpretation of age and cohort effects is similar to this example of period effect interpretation.

Median polish

The sensitivity of APC model results to the arbitrary choice of parameter constraints in order to make regression models identifiable is a critique primarily of first order effects (e.g. those with linear relationship—on the scale of the link function—to the outcome, as estimated from a regression slope coefficient). Alternatively, second order effects (e.g. those with non-linear relation to the outcome) can be identified (7, 8).

The median polish is one non-parametric method for identifying non-linearities represented by departure from additivity as evidenced by systematic patterns in the residuals from a 2-factor model (9). While Keyes, et al. points out that method can be conceived heuristically as analysis of residuals from a 2-factor regression model (e.g. $Y_i = \alpha + \beta * AGE_i + \gamma * PERIOD_i + e_i$; where Y=age-period specific log-rate, β=age effect, γ=period effect, and *e*=error) (10), the method need not be carried out via regression, but instead by a non-parametric, iterative process of subtracting the median from rows (age) and then columns (period) of a contingency table containing log-rates within each cell. Convergence is achieved when residual values stabilize. The values remaining in the table after this median polish are residuals which represent a combination of random error plus the systematic departure from linear additivity. These residuals can be plotted against cohort membership (cohort = PERIOD – AGE) to identify departure from the expectation of residuals being distributed $N(0,\sigma^2)$. To formally decompose systematic from random components, we regressed these residuals onto indicator variables for birth cohort membership.

In the absence of interaction (departure from additivity on log-linear scale), the residuals are expected to center around zero. However as demonstrated in Web Figure 2 residuals for heart disease mortality rates from 1973-2010 varied systematically by birth cohort in excess of anticipated random error. The trends in residuals were relatively similar between black and white women, and similar in shape among black and white men, but there was a racial separation in magnitude of residuals for men born between 1920 and 1960. Web Table 3 summarizes the race-sex specific contrasts from the model regressing cohort on residuals. These ratios represent the magnitude of departure from simple additivity of age and period, and most significant contrasts tend towards antagonistic, reflecting a lower rate than expected from race-sex specific age and period alone. This faster-than-expected decline is apparent for white born between 1928 and 1957. Among blacks, this pattern of accelerated decline across generations is delayed, with significant age-period interaction beginning in 1938 and 1948 for women and men respectively.

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Web Table 1. Black-white rate ratios for heart disease mortality by age and year of death

Men

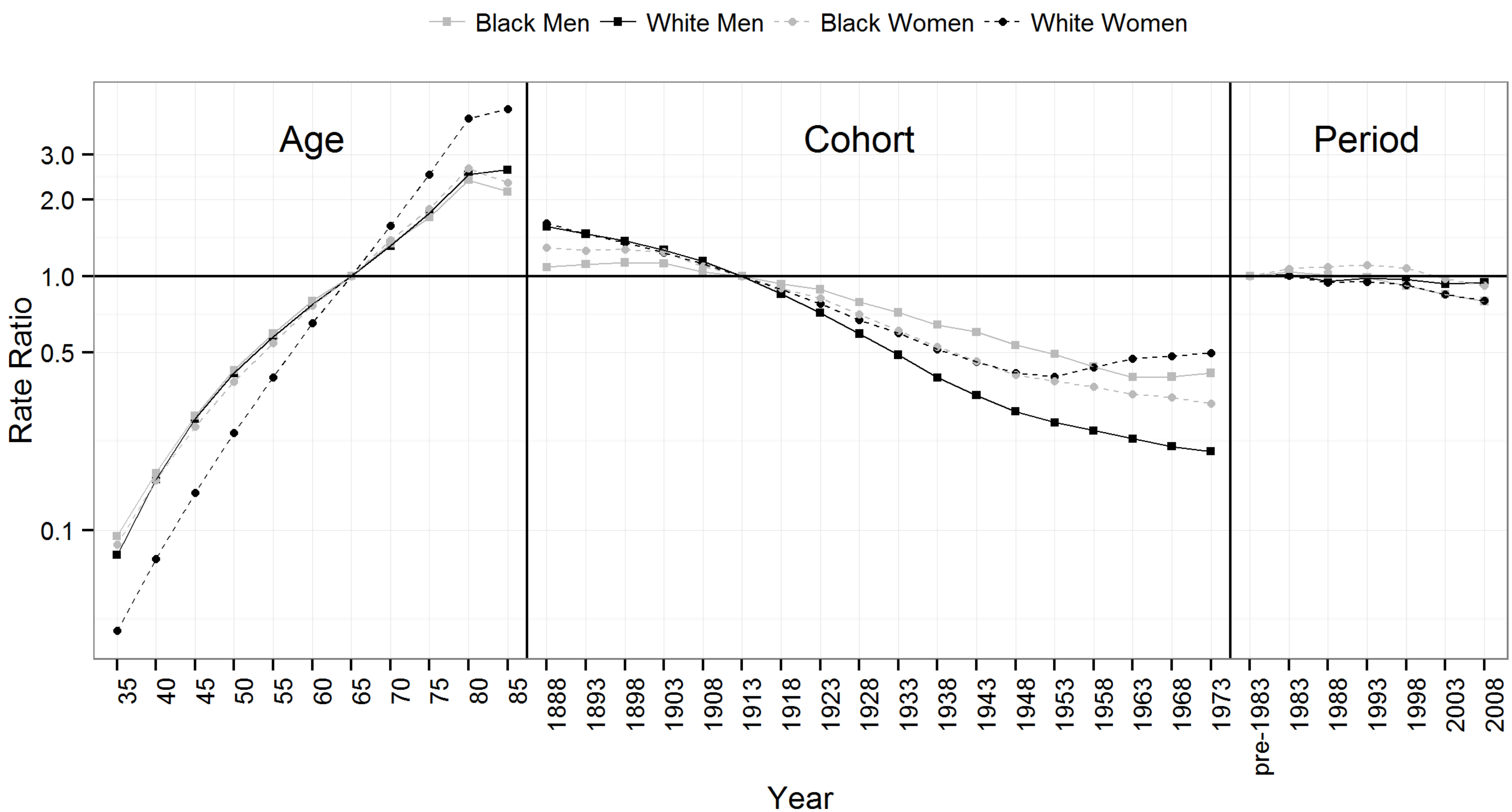
	1973-77			1978-82			1983-87			1988-92			1993-97			1998-2002			2003-07			2008-10		
	RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI	
35-39	2.18	2.09	2.27	2.25	2.17	2.34	2.38	2.30	2.47	2.72	2.62	2.82	2.32	2.24	2.40	2.17	2.09	2.26	2.22	2.13	2.30	2.24	2.12	2.36
40-44	1.68	1.63	1.73	1.94	1.89	2.00	2.13	2.06	2.19	2.28	2.22	2.35	2.20	2.15	2.26	1.97	1.92	2.02	1.82	1.77	1.87	1.85	1.78	1.92
45-49	1.54	1.51	1.58	1.67	1.63	1.71	1.80	1.76	1.85	2.11	2.07	2.16	2.12	2.07	2.17	1.96	1.92	2.00	1.85	1.81	1.89	1.69	1.64	1.74
50-54	1.42	1.40	1.45	1.53	1.51	1.56	1.68	1.65	1.71	1.91	1.87	1.94	1.98	1.94	2.02	1.92	1.89	1.96	1.91	1.87	1.94	1.70	1.66	1.74
55-59	1.23	1.21	1.25	1.42	1.40	1.44	1.49	1.46	1.51	1.73	1.70	1.76	1.82	1.79	1.85	1.90	1.87	1.93	1.88	1.85	1.91	1.77	1.74	1.81
60-64	1.13	1.12	1.15	1.26	1.24	1.27	1.45	1.43	1.47	1.58	1.56	1.60	1.64	1.61	1.66	1.73	1.70	1.75	1.79	1.77	1.82	1.74	1.71	1.78
65-69	1.00	0.99	1.01	1.08	1.07	1.10	1.24	1.23	1.26	1.44	1.42	1.46	1.43	1.42	1.45	1.53	1.51	1.56	1.64	1.62	1.67	1.71	1.68	1.74
70-74	1.01	1.00	1.03	1.00	0.99	1.02	1.14	1.13	1.16	1.29	1.27	1.30	1.41	1.39	1.43	1.42	1.41	1.44	1.50	1.48	1.52	1.51	1.48	1.54
75-79	0.85	0.84	0.87	0.90	0.89	0.91	0.98	0.96	0.99	1.13	1.12	1.15	1.17	1.16	1.19	1.25	1.24	1.27	1.33	1.31	1.35	1.36	1.33	1.38
80-84	0.79	0.78	0.80	0.88	0.87	0.90	0.97	0.95	0.98	1.02	1.00	1.03	1.06	1.05	1.08	1.08	1.06	1.10	1.14	1.12	1.16	1.15	1.12	1.17
≥85	0.62	0.61	0.64	0.69	0.68	0.71	0.75	0.74	0.77	0.85	0.83	0.86	0.83	0.82	0.84	0.86	0.85	0.88	0.91	0.89	0.92	0.91	0.89	0.93

Women

	1973-77			1978-82			1983-87			1988-92			1993-97			1998-2002			2003-07			2008-10		
	RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI	
35-39	3.76	3.54	3.98	3.52	3.32	3.73	3.63	3.43	3.83	4.00	3.79	4.22	3.58	3.40	3.75	2.94	2.80	3.09	2.80	2.66	2.96	2.57	2.39	2.76
40-44	3.38	3.24	3.52	3.24	3.10	3.38	3.40	3.26	3.55	4.04	3.88	4.21	3.73	3.59	3.87	3.33	3.21	3.46	2.74	2.64	2.85	2.65	2.51	2.79
45-49	3.22	3.12	3.32	3.04	2.94	3.14	3.01	2.91	3.12	3.53	3.42	3.66	3.46	3.35	3.57	3.35	3.25	3.45	2.77	2.69	2.85	2.50	2.41	2.60
50-54	2.80	2.74	2.87	2.73	2.66	2.80	2.73	2.66	2.81	3.04	2.96	3.12	3.00	2.93	3.09	2.88	2.81	2.95	2.84	2.77	2.91	2.53	2.45	2.61
55-59	2.29	2.25	2.34	2.34	2.30	2.39	2.43	2.38	2.48	2.56	2.51	2.62	2.62	2.56	2.68	2.57	2.51	2.63	2.51	2.46	2.57	2.45	2.38	2.52
60-64	1.96	1.93	1.99	1.97	1.93	2.00	2.09	2.06	2.13	2.29	2.25	2.33	2.19	2.15	2.23	2.23	2.19	2.28	2.19	2.15	2.23	2.16	2.10	2.22
65-69	1.61	1.58	1.63	1.61	1.59	1.63	1.73	1.70	1.75	1.99	1.96	2.02	1.95	1.92	1.98	1.95	1.92	1.98	1.95	1.92	1.99	1.90	1.86	1.95
70-74	1.50	1.48	1.52	1.41	1.39	1.43	1.52	1.50	1.54	1.63	1.61	1.65	1.77	1.75	1.79	1.73	1.71	1.76	1.68	1.65	1.71	1.68	1.64	1.72
75-79	1.08	1.06	1.09	1.17	1.15	1.18	1.24	1.22	1.25	1.37	1.36	1.39	1.41	1.39	1.43	1.50	1.48	1.52	1.47	1.45	1.49	1.45	1.42	1.48
80-84	0.88	0.87	0.90	1.01	0.99	1.02	1.11	1.10	1.13	1.16	1.15	1.17	1.20	1.19	1.21	1.21	1.19	1.22	1.25	1.23	1.26	1.24	1.22	1.26
≥85	0.67	0.65	0.68	0.72	0.71	0.73	0.82	0.81	0.83	0.94	0.93	0.96	0.93	0.92	0.94	0.97	0.96	0.98	1.00	0.99	1.02	0.99	0.97	1.01

Note: Black-white heart disease mortality ratios with 95% confidence intervals presented by age category and year of death. Age trends in black-white disparities in heart disease mortality visible down columns; period trends visible across rows; cohort trends are visible along diagonal (e.g. individuals aged 35-39 years in 1973-1977 aged into the 40-44 year group in 1978-82).

Web Figure 1. Constrained Poisson within-group (race, sex) age-period-cohort regression results



See Table 3 in main manuscript for estimates and 95% confidence intervals. These within-race-sex contrasts are derived from the same interaction model as the results plotted in Figure 5 in the main manuscript.

Web Table 2. Constrained age-period-cohort model black-white contrasts by sex

		White Men	Black Men			White Women	Black Women		
		RR	RR	95% CI		RR	RR	95% CI	
Age	35-39	1.00	1.31	1.25	1.36	1.00	3.55	3.38	3.74
	40-44	1.00	1.16	1.12	1.21	1.00	3.32	3.19	3.46
	45-49	1.00	1.13	1.10	1.16	1.00	2.97	2.88	3.06
	50-54	1.00	1.13	1.11	1.15	1.00	2.59	2.53	2.65
	55-59	1.00	1.13	1.11	1.14	1.00	2.22	2.19	2.26
	60-64	1.00	1.13	1.12	1.14	1.00	1.91	1.89	1.93
	65-69	1.00	1.10	1.09	1.11	1.00	1.63	1.61	1.64
	70-74	1.00	1.12	1.10	1.13	1.00	1.43	1.41	1.45
	75-79	1.00	1.06	1.04	1.08	1.00	1.19	1.16	1.21
	80-84	1.00	1.05	1.02	1.07	1.00	1.03	1.01	1.06
	≥85	1.00	0.90	0.87	0.93	1.00	0.83	0.80	0.86
Period	pre-1983	1.00	1.10	1.09	1.11	1.00	1.63	1.61	1.64
	1983-87	1.00	1.12	1.11	1.14	1.00	1.73	1.71	1.75
	1988-92	1.00	1.16	1.15	1.18	1.00	1.87	1.84	1.90
	1993-97	1.00	1.11	1.08	1.13	1.00	1.90	1.85	1.94
	1998-2002	1.00	1.04	1.01	1.07	1.00	1.90	1.84	1.96
	2003-07	1.00	1.00	0.96	1.04	1.00	1.88	1.81	1.96
	2008-10	1.00	0.93	0.89	0.97	1.00	1.86	1.77	1.95
Cohort	1888-1892	1.00	0.76	0.73	0.79	1.00	1.31	1.26	1.36
	1893-1897	1.00	0.84	0.81	0.86	1.00	1.40	1.36	1.44
	1898-1902	1.00	0.90	0.89	0.92	1.00	1.53	1.50	1.56
	1903-1907	1.00	0.97	0.96	0.99	1.00	1.64	1.62	1.67
	1908-1912	1.00	1.00	0.99	1.01	1.00	1.59	1.58	1.61
	1913-1917	1.00	1.10	1.09	1.11	1.00	1.63	1.61	1.64
	1918-1922	1.00	1.20	1.19	1.22	1.00	1.65	1.62	1.67
	1923-1927	1.00	1.36	1.33	1.39	1.00	1.72	1.68	1.75
	1928-1932	1.00	1.47	1.43	1.50	1.00	1.71	1.66	1.76
	1933-1937	1.00	1.62	1.56	1.67	1.00	1.67	1.61	1.73
	1938-1942	1.00	1.78	1.71	1.85	1.00	1.67	1.59	1.74
	1943-1947	1.00	1.95	1.86	2.04	1.00	1.64	1.55	1.72

1948-1952	1.00	2.01	1.90	2.12	1.00	1.60	1.51	1.70
1953-1957	1.00	2.04	1.92	2.17	1.00	1.56	1.46	1.67
1958-1962	1.00	1.96	1.83	2.10	1.00	1.37	1.27	1.48
1963-1967	1.00	1.92	1.78	2.08	1.00	1.17	1.08	1.28
1968-1972	1.00	2.07	1.89	2.26	1.00	1.12	1.02	1.24
1973-1975	1.00	2.24	2.01	2.48	1.00	1.03	0.91	1.17

CI, confidence interval; RR, rate ratio.

Note: Results from 3-factor constrained Poisson regression with interaction between each time dimension (age x race x sex, period x race x sex, and cohort x race x sex). Contrasts presented in this table compare black to white (referent) within each sex group and at each time value, conditional on other time scales.

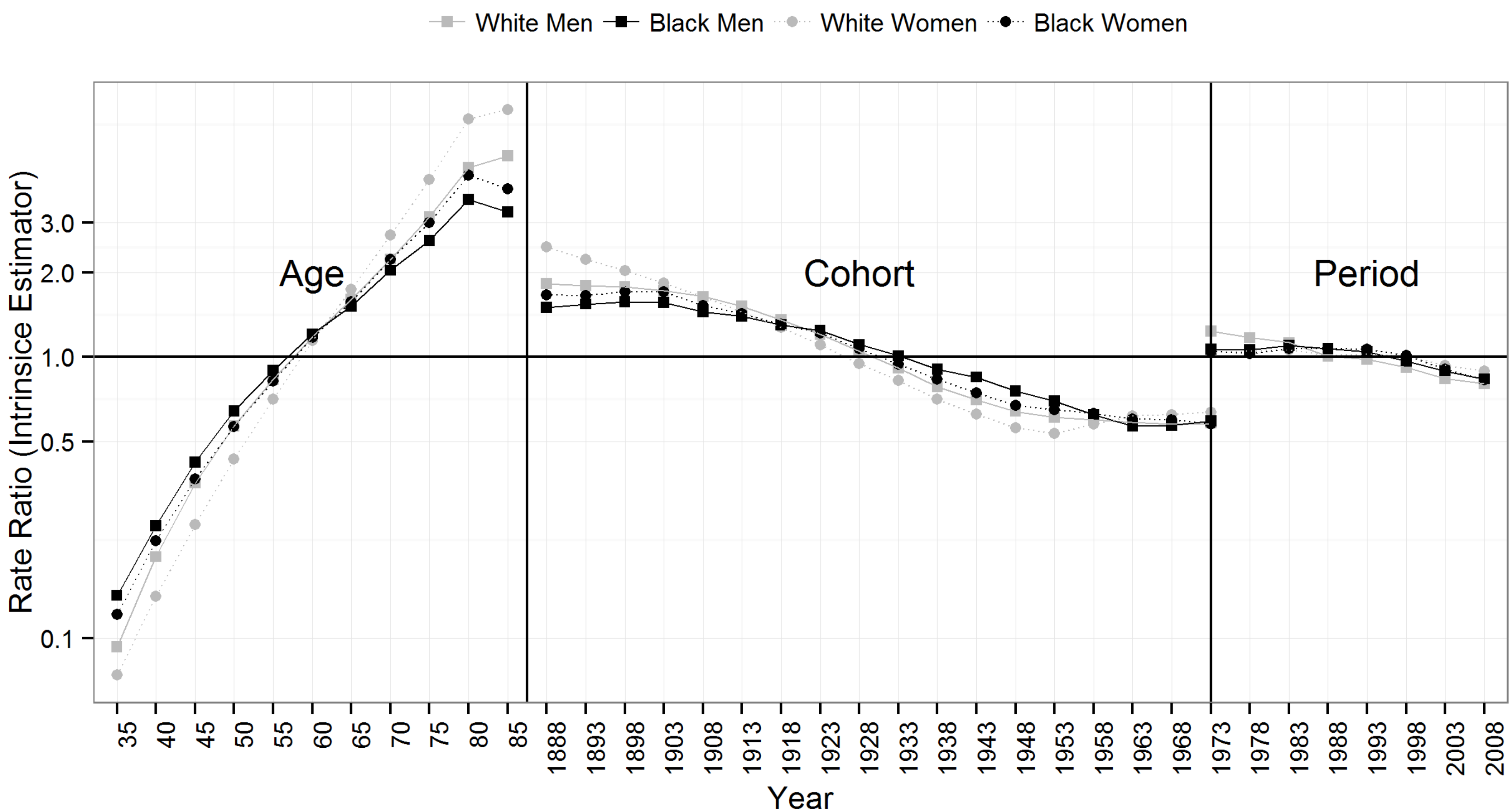
Web Table 3. Age-period-cohort results from race- and sex- stratified intrinsic estimator models

		WHITE MEN			WHITE WOMEN			BLACK MEN			BLACK WOMEN		
		RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI	
Exponentiated intercept		0.0051	0.0051	0.0052	0.0023	0.0022	0.0023	0.0072	0.0071	0.0072	0.0042	0.0042	0.0043
AGE	35-39	0.09	0.09	0.10	0.07	0.07	0.08	0.14	0.14	0.15	0.12	0.12	0.13
	40-44	0.20	0.19	0.20	0.14	0.13	0.15	0.25	0.24	0.26	0.22	0.21	0.23
	45-49	0.36	0.34	0.37	0.25	0.24	0.27	0.42	0.41	0.43	0.37	0.36	0.38
	50-54	0.57	0.55	0.58	0.43	0.42	0.45	0.64	0.63	0.65	0.57	0.55	0.58
	55-59	0.83	0.82	0.85	0.71	0.69	0.73	0.89	0.88	0.91	0.82	0.80	0.84
	60-64	1.18	1.16	1.20	1.15	1.12	1.18	1.21	1.19	1.23	1.18	1.15	1.20
	65-69	1.61	1.58	1.63	1.74	1.70	1.78	1.52	1.49	1.54	1.57	1.54	1.60
	70-74	2.23	2.19	2.26	2.71	2.66	2.76	2.03	2.00	2.06	2.22	2.18	2.26
	75-79	3.15	3.10	3.20	4.27	4.20	4.34	2.59	2.55	2.63	3.00	2.95	3.05
	80-84	4.71	4.64	4.79	7.03	6.91	7.15	3.64	3.58	3.70	4.43	4.36	4.51
	≥85	5.20	5.10	5.30	7.58	7.43	7.74	3.28	3.22	3.35	3.97	3.89	4.04
PERIOD	1873-77	1.24	1.21	1.26	1.04	1.01	1.06	1.06	1.05	1.08	1.05	1.03	1.07
	1978-82	1.17	1.15	1.19	1.05	1.03	1.07	1.06	1.05	1.08	1.03	1.01	1.04
	1983-87	1.12	1.11	1.14	1.06	1.05	1.08	1.10	1.08	1.11	1.07	1.05	1.09
	1988-92	1.01	0.99	1.02	1.01	1.00	1.03	1.07	1.06	1.09	1.07	1.05	1.09
	1993-97	0.98	0.97	1.00	1.02	1.01	1.04	1.04	1.03	1.06	1.06	1.05	1.08
	1998-2002	0.92	0.91	0.94	1.01	0.99	1.02	0.97	0.95	0.98	1.01	1.00	1.03
	2003-07	0.84	0.82	0.85	0.93	0.92	0.95	0.89	0.88	0.91	0.91	0.89	0.92
	2008-10	0.81	0.79	0.82	0.89	0.87	0.92	0.84	0.82	0.85	0.83	0.81	0.85
COHORT	1888-1892	1.82	1.74	1.91	2.47	2.37	2.57	1.50	1.41	1.59	1.66	1.58	1.76
	1893-1897	1.80	1.74	1.86	2.22	2.15	2.29	1.54	1.49	1.60	1.66	1.60	1.72
	1898-1902	1.78	1.73	1.82	2.03	1.98	2.09	1.57	1.53	1.61	1.71	1.66	1.76
	1903-1907	1.72	1.68	1.77	1.83	1.78	1.88	1.56	1.52	1.60	1.71	1.66	1.75
	1908-1912	1.64	1.61	1.68	1.64	1.60	1.68	1.44	1.41	1.48	1.53	1.49	1.56
	1913-1917	1.51	1.48	1.55	1.45	1.42	1.49	1.40	1.37	1.42	1.43	1.40	1.46
	1918-1922	1.36	1.33	1.39	1.27	1.24	1.31	1.30	1.28	1.33	1.31	1.28	1.33
	1923-1927	1.20	1.18	1.23	1.10	1.07	1.14	1.24	1.22	1.26	1.22	1.19	1.25
	1928-1932	1.05	1.02	1.08	0.95	0.91	0.98	1.11	1.09	1.13	1.07	1.05	1.10

1933-1937	0.91	0.89	0.94	0.83	0.79	0.86	1.01	0.99	1.03	0.94	0.92	0.97
1938-1942	0.78	0.76	0.81	0.71	0.68	0.74	0.91	0.88	0.93	0.83	0.81	0.86
1943-1947	0.70	0.68	0.73	0.63	0.59	0.66	0.85	0.83	0.87	0.75	0.72	0.77
1948-1952	0.64	0.61	0.67	0.56	0.53	0.60	0.76	0.74	0.78	0.67	0.65	0.70
1953-1957	0.61	0.58	0.64	0.53	0.50	0.57	0.70	0.68	0.72	0.65	0.62	0.68
1958-1962	0.60	0.57	0.63	0.58	0.53	0.63	0.62	0.60	0.65	0.63	0.60	0.66
1963-1967	0.59	0.55	0.63	0.62	0.56	0.69	0.57	0.54	0.59	0.60	0.56	0.64
1968-1972	0.58	0.52	0.65	0.62	0.53	0.73	0.57	0.54	0.61	0.60	0.55	0.65
1973-1975	0.58	0.45	0.74	0.64	0.46	0.89	0.59	0.52	0.68	0.58	0.47	0.70

CI, confidence interval; RR, rate ratio.

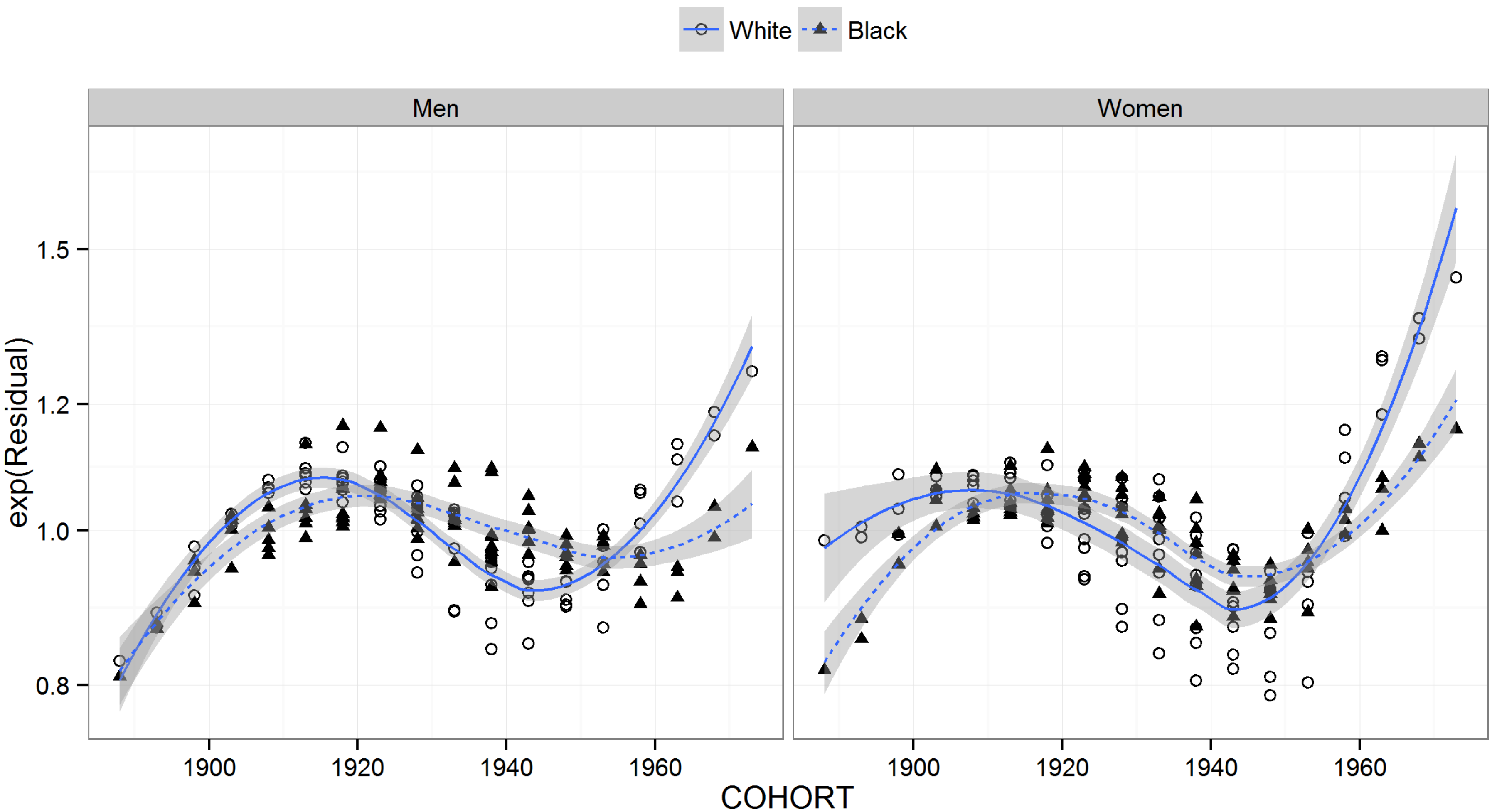
Web Figure 2. Age-period-cohort intrinsic estimator rate ratios by race and sex



Web Table 4. Results from regression of median polish residuals on birth cohort membership by race and sex

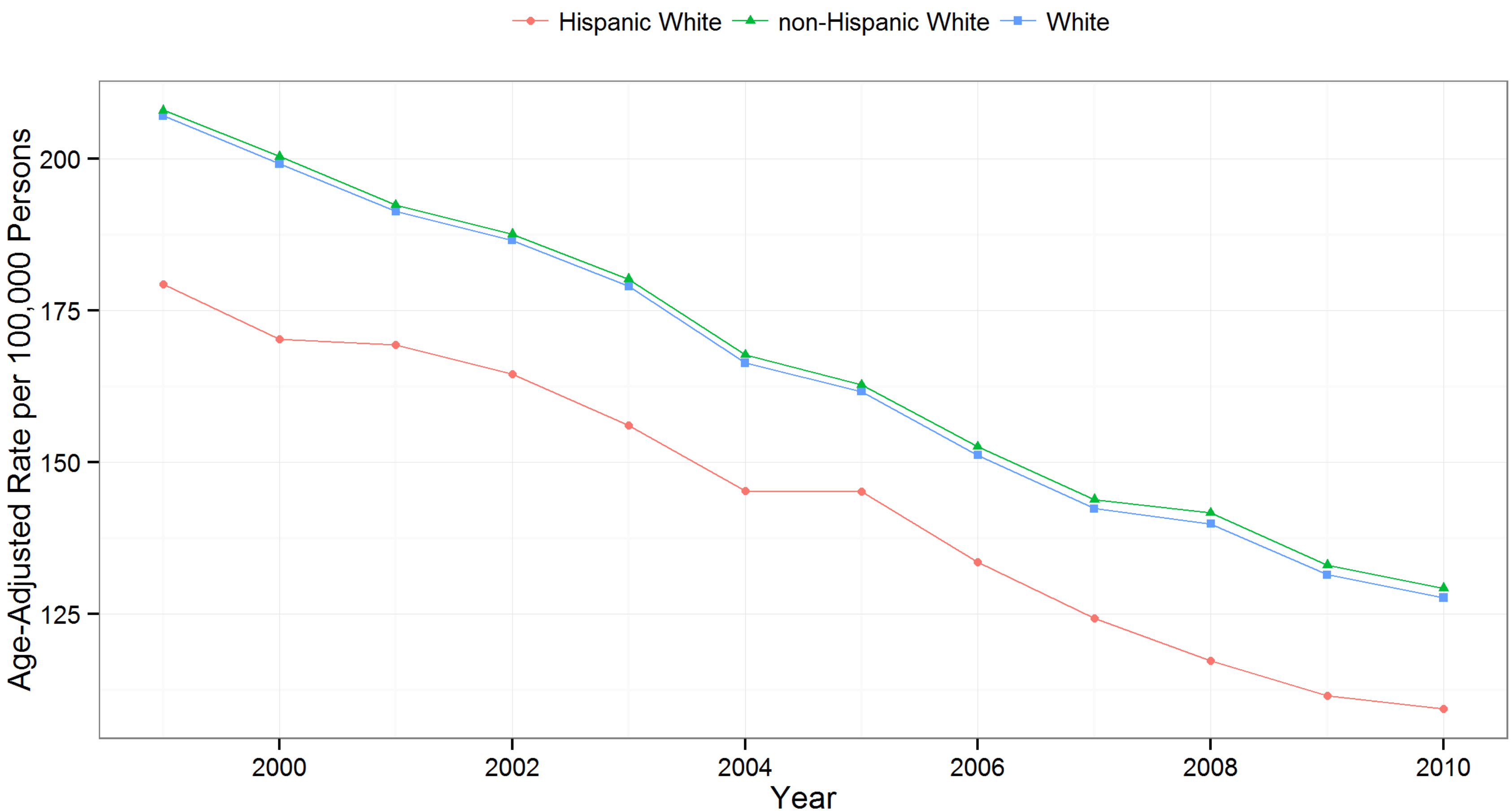
	White Men			White Women			Black Men			Black Women		
YEAR	RR	95% CI		RR	95% CI		RR	95% CI		RR	95% CI	
1888-1892	**0.76**	**0.69**	**0.84**	0.93	0.84	1.02	**0.78**	**0.71**	**0.86**	**0.78**	**0.71**	**0.86**
1893-1897	**0.81**	**0.75**	**0.87**	0.94	0.87	1.01	**0.84**	**0.78**	**0.91**	**0.83**	**0.77**	**0.89**
1898-1902	**0.87**	**0.81**	**0.92**	0.97	0.91	1.04	**0.90**	**0.85**	**0.96**	**0.92**	**0.87**	**0.98**
1903-1907	**0.93**	**0.88**	**0.99**	1.00	0.94	1.06	0.96	0.91	1.02	1.00	0.95	1.06
1908-1912	0.98	0.93	1.03	1.01	0.95	1.06	0.96	0.91	1.01	0.98	0.93	1.03
1913-1917	1.00			1.00			1.00			1.00		
1918-1922	0.99	0.94	1.04	0.98	0.93	1.03	1.01	0.96	1.06	1.00	0.95	1.05
1923-1927	0.97	0.92	1.02	**0.95**	**0.90**	**0.99**	1.04	0.99	1.09	1.02	0.97	1.07
1928-1932	**0.93**	**0.89**	**0.98**	**0.92**	**0.88**	**0.96**	1.00	0.95	1.04	0.98	0.94	1.03
1933-1937	**0.90**	**0.86**	**0.95**	**0.91**	**0.87**	**0.95**	0.99	0.94	1.04	0.95	0.91	1.00
1938-1942	**0.85**	**0.81**	**0.89**	**0.86**	**0.82**	**0.91**	0.96	0.92	1.01	**0.92**	**0.88**	**0.96**
1943-1947	**0.84**	**0.80**	**0.89**	**0.84**	**0.80**	**0.88**	0.97	0.92	1.02	**0.89**	**0.85**	**0.94**
1948-1952	**0.84**	**0.80**	**0.88**	**0.82**	**0.78**	**0.86**	**0.93**	**0.89**	**0.98**	**0.88**	**0.83**	**0.92**
1953-1957	**0.87**	**0.82**	**0.92**	**0.86**	**0.81**	**0.90**	**0.93**	**0.88**	**0.98**	**0.91**	**0.86**	**0.96**
1958-1962	0.94	0.89	1.00	1.01	0.95	1.07	**0.90**	**0.85**	**0.96**	0.97	0.92	1.03
1963-1967	1.00	0.94	1.07	**1.17**	**1.10**	**1.25**	**0.90**	**0.85**	**0.96**	1.00	0.94	1.07
1968-1972	**1.07**	**1.00**	**1.15**	**1.26**	**1.17**	**1.35**	0.98	0.91	1.05	1.07	1.00	1.15
1973-1975	**1.16**	**1.05**	**1.27**	**1.36**	**1.23**	**1.49**	1.09	0.99	1.20	1.11	1.00	1.22

Web Figure 3. Exponentiated residuals from race- and sex-specific median polish of age-period heart disease mortality rates.



Points represent residuals. Lines and confidence bands are from a LOESS smoother.

Web Figure 4. Age-adjusted heart disease mortality rates by race and ethnicity, United States, 1999-2010



Source: CDC WONDER, National Center for Health Statistics, National Vital Statistics System (http://wonder.cdc.gov/).