Table S1. Derivation cohorts of SCORE[1]

Country	Study	Source population: general population, occupational population, primary care or secondary care	Number of participants	Age range at baseline	Baseline date
Finland	The FINRISK Study[2]	General population: residents from various areas in Finland.	37,296	24-64	1972/1977(a) 1982/1987(b)
Russia	Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations[3]	General population: male residents from Moscow and Leningrad	3,325	37-62	1975-77
Norway	Norwegian Counties Study[4, 5]	General population: residents from Finnmark County in Northern Norway	48,425	35-49	1974-78
United Kingdom (BRHS)	British Regional Heart Study (BRHS)[6]	General population: male residents from 24 British towns recruited through general practices*	7,292	38-61	1978-80
United Kingdom (Scotland)	Scottish Heart Health and Scottish MONICA cohort follow up studies[7]	General population: residents from 25 districts in Scotland recruited through general practices*	12,285	25-66	1984-87
Denmark	The Glostrup Population Studies[8]	General population: residents from Copenhagen County	9,945	29-80	1977-91
Sweden	The Primary Prevention Study in Göteborg (Gothenburg)[9]	General population: male residents from Göteborg	7,435	47-56	1970-73
Belgium	Belgian Interuniversity Research on Nutrition and Health (BIRNH)[10]	General population: residents from 43 districts in Belgium	10,641	25-75	1980-1984
Germany	The MONICA Augsburg cohort study[11]	General population: residents from the city of Augsburg and the Landkreise Augsburg and Aichach-Friedberg districts in Germany	3,968	25-65	1984-85
Italy	Risk Factors and Life Expectancy (RIFLE) pooling project[12]	General population: 50 samples of residents from various Italian regions. Occupational population: 1 male and 1 female sample of occupational groups in Rome	53,439	19-80	See reference
France	Paris prospective study[13]	Occupational population: men working in the Paris Police Administration	7,337	43-53	1967-72
Spain	Catalonia Cohort Study(1), Barcelona Multifactorial Trial (2), Factory Heart Study (3)[14-16]	General population (1): residents of Catalonia Occupational population: male workers in Spain (2,3)	4,701	25-68	1986-88(1) 1974-77(2) 1980-82(3)

* The researchers intended to study residents and did not aim to study patients in primary care. The general practices were only used to recruit these residents. Therefore, the source population in this study is classified as the general population.

Table S2. Derivation cohorts used for the multipliers in SCORE-FNF

Country	Study	Source population: general population, occupational population, primary care or secondary care	Number of participants	Age range at baseline	Baseline date
Netherlands	The EPIC-NL Study[17-20]	General population: residents from Amsterdam, Doetinchem, and Maastricht (MORGEN cohort) and female residents from Utrecht or its vicinity (Prospect cohort)	31,000	37.5-67.5	1993-97

Table S3. Derivation cohorts of Globorisk[21]

Country	Study	Source population: general population, occupational population, primary care or secondary care	Number of participants	Age range at baseline	Baseline date
United States	Atherosclerosis Risk In Communities (ARIC)[22]	General population: residents from four US communities - Forsyth County, North Carolina, Jackson, Mississippi, suburbs of Minneapolis, Minnesota, and Washington County, Maryland	13,405	44-66	1987-89
United States	Cardiovascular Health Study (CHS)[23]	General population: adults aged 65 years and older from four communities - Pittsburgh (Allegheny County), Pennsylvania; Forsyth County, North Carolina; Sacramento County, California; and Washington County, Maryland.	4,364	66-90	1989-93
United States	Framingham Heart Study original cohort (FHS)[24]	General population: family members in Framingham, Massachusetts	3,027	40-65	1948-51
United States	Framingham heart study offspring cohort (FHS-OFF)[25]	General population: children of family members of participants in the FHS	1,822	40-62	1971
United States	Honolulu heart program (HHP)[26, 27]	General population: men of Japanese ancestry in Hawaii	7,572	45-68	1965-68
United States	Multiple Risk Factor Intervention Trial (MRFIT)[28]	Unclear: male patients with one or more cardiovascular risk factors in 22 clinical centers in 18 cities	10,481	40-57	1973-76
United States	Puerto Rico heart health program (PRHHP)[29]	General population: urban and rural Puerto Rican men	5,416	42-77	1965
United States	women's health initiative clinical trial (WHICT)[30]	Various sources: women from the general population and women participating in screening programs or health care organizations	4,042	50-79	1993

Table S4. Inclusion and exclusion criteria of SCORE, SCORE-FNF, Globo-lab and Globo-office

SCORE / SCORE-FNF	**Globo-lab and Globo-office**
Age between 40 and 70 years	Age between 40 and 74 years
Systolic blood pressure between 120 and 180 mmHg	Systolic blood pressure between 120 and 180 mmHg
Total cholesterol-HDL cholesterol ratio between 3 and 8	Total cholesterol between 1.75 and 22 mmol/L
	Body mass index below 80 kg/m2
No history of Diabetes Mellitus (ICPC-1: T90) or Cardiovascular disease (ICPC-1: K75)	No history of Coronary Heart Disease or stroke (ICD-10: I20-I25; I60-I69)
No missing data on predictors (age, sex, systolic blood pressure, smoking status, total cholesterol- HDL cholesterol ratio, Rheumatoid Arthritis (ICPC-1: L88)	No missing data on predictors (age, sex, systolic blood pressure, smoking status, diabetes* (ICPC-1: T90), total cholesterol*, Body Mass Index+)
10-year follow-up	10-year follow-up

* Applicable for Globo-lab only
+ Applicable for Globo-office only

Box S1: Determination of smoking status

To determine the smoking status of a patient at baseline we first used information on smoking status in the period between 1 January 2008 and 1 January 2010 to determine whether a patient was a smoker, a non-smoker, or "smoking status unknown" at baseline. Then, we used information reported between 1 and 10 years after baseline for those with "smoking status unknown": we classified patients as non-smokers if "never smoked" had been documented and as "smoking unclear" in case of unclear or contradictory information. In the latter case we excluded these patients from the study because of unclear smoking status. Next, we assumed that the remaining patients with "smoking status unknown" were non-smokers at baseline. We checked this assumption with available data from a questionnaire that included smoking for 7 practices in our general practice research database, which showed that the assumption is plausible.

Box S2: Adaptation to the original SCORE function

Step 1

Calculating the 10-year risk of coronary and non-coronary cardiovascular disease separately for the person's age and their age in 10 years time, using the values for α and p shown in table A. The underlying survival probability, S0, is given by:

$$S_0(\text{age}) = \exp\left\{-\left(\exp(\alpha)\right)(\text{age}-20)^p\right\}$$

$$S_0(\text{age}+10) = \exp\left\{-\left(\exp(\alpha)\right)(\text{age}-10)^p\right\}^* \qquad (1)$$

* the Weibull model is typically expressed in terms of $\lambda = \exp(\alpha)$

Step 2

Using the coefficients in table B, calculate the weighted sum, *w*, of the risk factors cholesterol, smoking, and systolic blood pressure (SBP). Two weighted sums will be calculated, one for coronary heart disease and one for non-coronary cardiovascular disease. Smoking is coded as 1 for current and 0 for a non-smoker, so no value for smoking has to be entered if the person is a non-smoker. Cholesterol ratio is the HDL/Total cholesterol and SBP is measured in mmHg. The weighting for each risk factor is denoted by ß.

$$w = \beta_{ratio}\left(Cholesterol\ ratio - 5\right) + \beta_{SBP}\left(SBP - 120\right) + \beta_{SMOKER}\left(current\right) \qquad (2)$$

Step 3

Combine the underlying risk of coronary heart disease and for non-coronary heart cardiovascular disease, at the person's age and their age ten years from now (four calculations) that were calculated in step 1 with the weighted sum of a person's risk factors from step 2 for the two end-points, coronary heart disease and non-coronary cardiovascular disease to get the probability of survival at each age for each cause.

$$S(\mathbf{age}) = \{S_0(\mathbf{age})\}^{\mathbf{exp(w)}} \quad (3)$$

Step 4

For each cause, calculate the 10-year survival probability based on the survival probability for the person's current age and the age in 10 years time:

$$S_{10}(\text{age}) = S(\text{age}+10)/S(\text{age}) \quad (4)$$

Denote the two survival probabilities as $SCHD_{10}$ and $SNonCHD_{10}$.

Step 5

Calculate the 10 year risk for each end-point as

$$R_{10} = 1 - S_{10}(\text{age}) \quad (5)$$

Step 6 (revised)

Combine the survival probabilities for the coronary heart disease and the non-coronary cardiovascular disease to get the 10-year risk of cardiovascular mortality.

$$\text{CVDRisk}_{10}(\text{age}) = 1 - \left[\text{SCHD}_{10}(\text{age})\right] \times \left[\text{SNonCHD}_{10}(\text{age})\right] \quad (6)$$

Table A: Coefficients for equation 1

		α	p	α	p
Low risk	Men	-22.20379	4.723130	-27.05140	5.764861
	Women	-29.46612	6.306837	-34.88610	7.598497
High risk	Men	-21.29703	4.680240	-26.86855	5.785877
	Women	-28.55937	6.249566	-34.70325	7.626199

Table B: Coefficients for equation 2

	CHD	non-CHD CVD
Current Smoker	0.62059271	0.6763035
Cholesterol/HDL ratio	0.29886707	0.04445451
Systolic BP (mmHg)	0.01669120	0.01875860

Table S5. ICPC-1, ICPC-2, and ICD-10 codes used for fatal and non-fatal CVD outcome measurement per model.

Fatal CVD outcomes	**SCORE**	ICD-10	I10-I25, R96, I46, I47-I51, I61-I65, G45, I67-I69, I70-I72 except for I62.0 and I67.1	CVD with an atherosclerotic cause, including ischemic heart disease, stroke and abdominal aorta-aneurysm
	Globorisk	ICD-10	I20-I25,I60-I69	Ischemic heart disease, stroke, or sudden cardiac death
Non-fatal CVD outcomes	SCORE-FNF	ICPC-1	K75, K77, K90, K91, K99.01	Myocardial infarction, heart failure, stroke, and peripheral vascular disease
		ICPC-2	K75, K77, K90, K91, K92	
		ICD-10	I21, I22, I50, I60-I72, I73.9, I74	
	Globorisk	ICPC-1	K75, K90, K91	Acute myocardial infarction, stroke
		ICPC-2	K75, K90, K91	
		ICD-10	I21, I22, I60-I69	

ICPC: International Classification of Primary Care; ICD: International Classification of Diseases

Box S3: Description of ICI, E50, and E90.

ICI represents the weighted difference between smoothed observed and predicted risks in which observations are weighted by the density function of the predicted risks. E50 and E90 represent the median and 90th percentile of the absolute difference between the observed and predicted risks.[31]

Box S4: Description of analyses that we performed to gain more insight into the selection of patients for risk assessment by GPs

First, we examined whether the general practice population differs from the general Dutch population in sex and age distribution. Second, we assessed whether the population that is eligible for risk prediction (based on age criteria and disease history) differs from the population with available information on all predictors. Third, we compared the CVD incidence rates in the populations eligible for risk prediction to the rates in the datasets used to generate the SCORE-FNF and Globorisk models. Fourth, we compared the age and SBP of the source population of the SCORE-FNF to the ages and SBPs of various populations in our dataset.

Table S6. Characteristics of patients that could and could be linked to the cause of death statistics

Characteristics	Could not be linked	Could be linked
N	1521	5776
Age (years), mean ± SD	60.3 ± 9.0	59.4 ± 8.6
Women, n (%)	772 (50.7%)	3186 (55.2%)
Systolic blood pressure (mmHg) mean ± SD	140 ± 17.3	140 ± 16.4
Smoking, n (%)	293 (19.3%)	809 (14.0%)

Table S7. Predicted and observed percentage cardiovascular events and ratio (predicted divided by observed) for Globo-lab-based, Globo-office-based, and SCORE-FNF by decile of risk.

	SCORE-FNF			**Globo-lab**			**Globo-office**		
Deciles of risk	Predicted events (%)	Observed events (%)	Ratio	Predicted events (%)	Observed events (%)	Ratio	Predicted events (%)	Observed events (%)	Ratio
1	1.7	9.8	0.17	0.7	4.6	0.16	0.8	5.4	0.15
2	3.4	13.3	0.26	1.5	7.2	0.21	1.8	5.2	0.33
3	5.0	15.0	0.33	2.1	5.5	0.37	2.6	7.2	0.36
4	6.7	16.7	0.40	2.7	7.4	0.37	3.6	8.4	0.43
5	8.7	14.7	0.59	3.5	3.6	0.98	4.7	8.1	0.558
6	10.8	15.6	0.69	4.3	6.4	0.68	5.9	9.8	0.60
7	13.3	19.0	0.70	5.3	5.7	0.93	7.5	9.2	0.81
8	16.4	20.7	0.79	6.6	8.3	0.79	9.6	6.8	1.41
9	21.2	27.8	0.76	8.2	10.7	0.77	13.0	10.4	1.26
10	35.0	33.6	1.04	12.6	9.8	1.29	29.0	7.9	3.69
Total	12.2	18.6	0.66	4.8	6.9	0.7	7.8	7.9	1.0

Table S8. Causes of death of deceased patients based on cause of death statistics after linkage.

	SCORE / SCORE-FNF (n=1981)	**Globo-lab (n=3588)**	**Globo-office (n=4399)**
Cause of death: CVD	5	6	8
Number of patients with fatal CVD which were not diagnosed with CVD prior to death (as reported in GP-EHR)	4	3	4
Cause of death: other	23	78	95
Cause of death: unknown	5	10	15
Total number of deceased patient	36	94	118

Values represent number of patients.

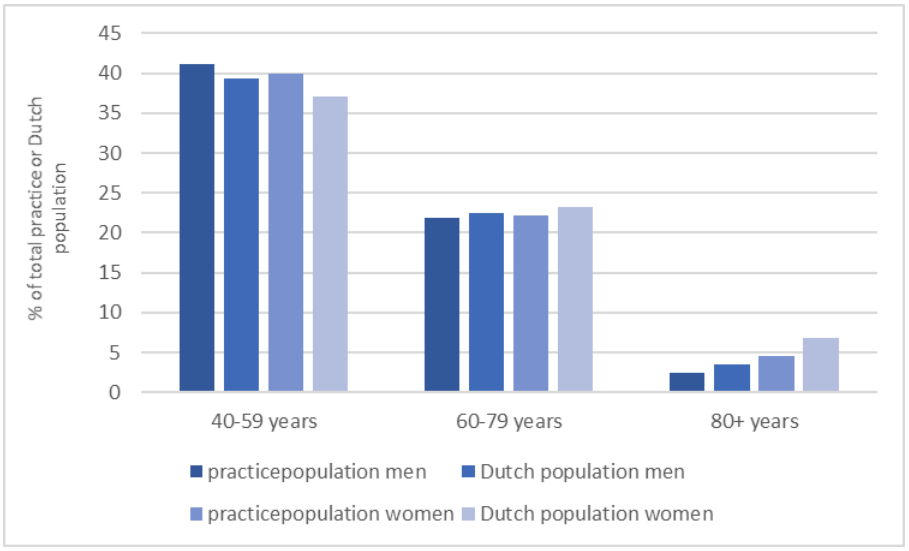

Figure S1: Age and sex distribution of the practice population (n=127.504) compared to the Dutch general population at 1 January 2009

Table S9. Incidence of first CVD in the SCORE-FNF cohort and in the general practice cohort

	SCORE-FNF cohort*	**general practice cohort****
Incidence of fatal and non-fatal CVD per 1000 patients per year	4.16	9.57

* The SCORE-FNF cohort [17, 20] includes 31,000 Dutch participants between 37.5-67.5 years of age who had no history of the selected CVD or DM at baseline (1993-97). The cohort included more women (≈75%) than men (≈25%). (During 10 years of follow up, a total number of 1,291 events were observed. For fatal CVD the ICD-codes for SCORE were used.
ICD 9: 401-414, 789.1, 798.2, 426-443 except for 426.7, 429.0, 432.1, 437.3, 437.4, 437.5.
ICD-10: (since 1996): I10-I25, R96, I46, I47-I51, I61-I65, G45, I67-I69, I70-I72 except for I62.0, I67.1.
For non-fatal CVD the following ICD-9 codes were used: 410, 428, 430-436 (minus 435), 440-442, 444, 443.9.
** The general practice cohort includes 62,817 Dutch patients between 40-70 years of age who had no history of the selected CVD or DM at baseline (1 January 2009). Patients were allowed to have missing data for the risk factors used in the risk prediction models SCORE and SCORE-FNF. During 10 years of follow up, a total number of 6,010 events were observed. For fatal and non-fatal CVD the following ICPC codes were used: K75, K77, K90, K91, K99.01.
CVD: cardiovascular disease, DM: diabetes mellitus, ICD: International Classification of Diseases, ICPC: International Classification of Primary Care

Table S10: Incidence of first CVD in the Globorisk cohort and in the general practice cohort

	Globorisk cohort*	**general practice cohort****
Incidence of fatal and non-fatal CVD per 1000 patients per year	8.04	7.54

* The Globorisk cohort [21] includes 50,129 United States participants between 40-90 years of age who had no history of the selected CVD at baseline (1948-1993). During 15 years of follow up, a total number of 6042 events were observed. For fatal and non-fatal CVD the following ICD-10 codes were used: I20–I25, I60–I69.
** The general practice cohort includes 67,986 Dutch patients between 40-74 years of age who had no history of the selected CVD at baseline (1 January 2009). Patients were allowed to have missing data for the risk factors used in the risk prediction models for Globorisk. During 10 years of follow up, a total number of 5,129 events were observed. For fatal and non-fatal CVD the following ICPC codes were used: K75, K90, K91.
CVD: cardiovascular disease; ICD: International Classification of Diseases, ICPC: International Classification of Primary Care

Table S11: Age and Systolic Blood Pressure in the EPIC-NL cohort and in the general practice cohorts at baseline

	EPIC-NL cohort (n=40,011)*		general practice cohort (n=110,562)	
Populations	Age (years) mean ± SD	SBP (mmHg), mean ± SD	Age (years) mean ± SD	SBP (mmHg), mean ± SD
Source population, aged 20-70, that includes patients with CVD and/or DM	49 ± 12	126.2 ± 19.0	45.1 ± 13.4 (n=110,562)	
Source population, aged 20-70, that includes patients with CVD and/or DM, and who had a SBP measurement in the baseline period			53.2 ± 11.1 (n=4,406)	141,6 ± 15.7 (n=4,406)
Eligible population, aged 40-70, who had no history of CVD and/or DM			53.2 ± 8.4 (n=62,817)	
Eligible population, aged 40-70, who had no history of CVD and/or DM, and who had a SBP measurement in the baseline period			56.1 ± 8.1 (n=3,264)	142.5 ± 15.8 (n-3,264)

* The EPIC-NL cohort [18] is the source population of the SCORE-FNF cohort and consists of two merged cohorts: the Prospect cohort and the MORGEN cohort.
SBP: Systolic Blood Pressure

References

1. Conroy, R.M., et al., *Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project.* Eur Heart J, 2003. **24**(11): p. 987-1003.
2. Vartiainen, E., et al., *Cardiovascular risk factor changes in Finland, 1972-1997.* Int J Epidemiol, 2000. **29**(1): p. 49-56.
3. *Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations. Prepared by the US-USSR Steering Committee for Problem Area 1: the pathogenesis of atherosclerosis.* Am J Cardiol, 1977. **40**(2): p. 260-8.
4. Bjartveit, K., et al., *The cardiovascular disease study in Norwegian counties. Background and organization.* Acta Med Scand Suppl, 1979. **634**: p. 1-70.
5. Njølstad, I., E. Arnesen, and P.G. Lund-Larsen, *Smoking, serum lipids, blood pressure, and sex differences in myocardial infarction. A 12-year follow-up of the Finnmark Study.* Circulation, 1996. **93**(3): p. 450-6.
6. Shaper, A.G., et al., *British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns.* Br Med J (Clin Res Ed), 1981. **283**(6285): p. 179-86.
7. Tunstall-Pedoe, H., et al., *Comparison of the prediction by 27 different factors of coronary heart disease and death in men and women of the Scottish Heart Health Study: cohort study.* Bmj, 1997. **315**(7110): p. 722-9.
8. Schroll, M., T. Jørgensen, and J. Ingerslev, *The Glostrup Population Studies, 1964-1992.* Dan Med Bull, 1992. **39**(3): p. 204-7.
9. Wilhelmsen, L., et al., *The multifactor primary prevention trial in Göteborg, Sweden.* Eur Heart J, 1986. **7**(4): p. 279-88.
10. *Regional differences in dietary habits, coronary risk factors and mortality rates in Belgium. 1. Design and methodology. Nutrition and health: an interuniversity study.* Acta Cardiol, 1984. **39**(4): p. 285-92.
11. Keil, U., et al., *Classical risk factors and their impact on incident non-fatal and fatal myocardial infarction and all-cause mortality in southern Germany. Results from the MONICA Augsburg cohort study 1984-1992. Monitoring Trends and Determinants in Cardiovascular Diseases.* Eur Heart J, 1998. **19**(8): p. 1197-207.
12. *Presentation of the rifle project risk factors and life expectancy. The RIFLE Research Group.* Eur J Epidemiol, 1993. **9**(5): p. 459-76.
13. Ducimetiere, P., et al., *Coronary heart disease in middle-aged Frenchmen. Comparisons between Paris Prospective Study, Seven Countries Study, and Pooling Project.* Lancet, 1980. **1**(8182): p. 1346-50.
14. Rodes, A., et al., *Recruitment methods and differences in early, late and non-respondents in the first MONICA-Catalonia population survey.* Rev Epidemiol Sante Publique, 1990. **38**(5-6): p. 447-53.
15. Sans Menéndez, S., *Ensayo randomizado de prevención multifactorial de la cardiopatía isquémica.* 1994, Publications of the Autonomous University of Barcelona: Bellaterra.
16. Sans Menéndez, S., et al., *[Multifactorial prevention of ischemic cardiopathy. Experiment on coronary risk factors in an industrial population. Results of the first 2 years].* Rev Sanid Hig Publica (Madr), 1981. **55**(5-6): p. 555-70.
17. Nederlands Huisartsen Genootschap. *[Guideline of the Dutch College of General Practitioners: Cardiovascular risk management (M84) {fourth review}] NHG-Standaard: Cardiovasculair risicomanagement (M84) (versie 4.0) (in Dutch)*. 2019 11 Mar 2022]; Available from: https://richtlijnen.nhg.org/standaarden/cardiovasculair-risicomanagement.
18. Beulens, J.W., et al., *Cohort profile: the EPIC-NL study.* Int J Epidemiol, 2010. **39**(5): p. 1170-

8.
19. van Dis, I., et al., *Effect of including nonfatal events in cardiovascular risk estimation, illustrated with data from The Netherlands.* Eur J Prev Cardiol, 2014. **21**(3): p. 377-83.
20. Van Dis, I., *[History and creation of the SCORE-risk table]. Geschiedenis en totstandkoming van de SCORE-risicotabel (in Dutch). .* Focus Vasculair, 2019: p. 13-19.
21. Hajifathalian, K., et al., *A novel risk score to predict cardiovascular disease risk in national populations (Globorisk): a pooled analysis of prospective cohorts and health examination surveys.* Lancet Diabetes Endocrinol, 2015. **3**(5): p. 339-55.
22. *The Atherosclerosis Risk in Communities (ARIC) Study: design and objectives. The ARIC investigators.* Am J Epidemiol, 1989. **129**(4): p. 687-702.
23. Tell, G.S., et al., *Recruitment of adults 65 years and older as participants in the Cardiovascular Health Study.* Ann Epidemiol, 1993. **3**(4): p. 358-66.
24. Dawber, T.R., G.F. Meadors, and F.E. Moore, Jr., *Epidemiological approaches to heart disease: the Framingham Study.* Am J Public Health Nations Health, 1951. **41**(3): p. 279-81.
25. Kannel, W.B., et al., *An investigation of coronary heart disease in families. The Framingham offspring study.* Am J Epidemiol, 1979. **110**(3): p. 281-90.
26. Worth, R.M. and A. Kagan, *Ascertainment of men of Japanese ancestry in Hawaii through World War II Selective Service registration.* J Chronic Dis, 1970. **23**(5): p. 389-97.
27. Kagan, A., et al., *Epidemiologic studies of coronary heart disease and stroke in Japanese men living in Japan, Hawaii and California: demographic, physical, dietary and biochemical characteristics.* J Chronic Dis, 1974. **27**(7-8): p. 345-64.
28. Kjelsberg, M.O., J.A. Cutler, and T.A. Dolecek, *Brief description of the Multiple Risk Factor Intervention Trial.* Am J Clin Nutr, 1997. **65**(1 Suppl): p. 191s-195s.
29. García-Palmieri, M.R., et al., *An epidemiological study on coronary heart disease in Puerto Rico: The Puerto Rico Heart Health Program.* Bol Asoc Med P R, 1969. **61**(6): p. 174-9.
30. *Design of the Women's Health Initiative clinical trial and observational study. The Women's Health Initiative Study Group.* Control Clin Trials, 1998. **19**(1): p. 61-109.
31. Austin, P.C., F.E. Harrell Jr, and D. van Klaveren, *Graphical calibration curves and the integrated calibration index (ICI) for survival models.* Statistics in Medicine, 2020. **39**(21): p. 2714-2742.