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## **Carotid Intima-Media Thickness in the Spanish Population: Reference Ranges and Association With Cardiovascular Risk Factors**

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**Table 1**

Percentiles of Mean and Maximal all Carotid, Common Carotid, Carotid Bulb and Internal Carotid Intima-Media Thickness (mm) in Women (N=1708)

	AC IMT		CCA IMT		CB IMT		ICA IMT	
	Mean	Maximal	Mean	Maximal	Mean	Maximal	Mean	Maximal
Percentile 5	0.509	0.554	0.501	0.542	0.508	0.558	0.463	0.500
Percentile 10	0.540	0.589	0.535	0.576	0.546	0.599	0.493	0.534
Percentile 25	0.597	0.651	0.595	0.642	0.613	0.676	0.549	0.599
Percentile 50	0.678	0.740	0.680	0.733	0.712	0.780	0.629	0.691
Percentile 75	0.785	0.856	0.789	0.851	0.834	0.918	0.738	0.808
Percentile 90	0.891	0.976	0.904	0.977	0.978	1.074	0.865	0.940
Percentile 95	0.978	1.073	0.988	1.067	1.081	1.206	0.955	1.050

AC, all carotid; CB, carotid bulb; CCA, common carotid artery; ICA, internal carotid artery; IMT, intima-media thickness

**Table 2**

Percentiles of Mean and Maximal all Carotid, Common Carotid, Carotid Bulb and Internal Carotid Intima-Media Thickness (mm) in Men (N=1453)

	AC IMT		CCA IMT		CB IMT		ICA IMT	
	Mean	Maximal	Mean	Maximal	Mean	Maximal	Mean	Maximal
Percentile 5	0.521	0.567	0.510	0.543	0.521	0.573	0.475	0.512
Percentile 10	0.553	0.600	0.544	0.585	0.562	0.613	0.506	0.546
Percentile 25	0.615	0.667	0.607	0.654	0.636	0.695	0.564	0.612
Percentile 50	0.702	0.763	0.696	0.751	0.741	0.807	0.649	0.708
Percentile 75	0.814	0.883	0.815	0.875	0.869	0.950	0.765	0.833
Percentile 90	0.918	1.006	0.927	0.999	1.006	1.117	0.879	0.962
Percentile 95	1.000	1.103	1.014	1.097	1.116	1.262	0.968	1.068

AC, all carotid; CB, carotid bulb; CCA, common carotid artery; ICA, internal carotid artery; IMT, intima-media thickness

**Table 3**

Percentiles of Mean and Maximal all Carotid, Common Carotid, Carotid Bulb and Internal Carotid Intima-Media Thickness (mm) in Women Free of Cardiovascular Risk Factors (N=468)

	AC IMT		CCA IMT		CB IMT		ICA IMT	
	Mean	Maximal	Mean	Maximal	Mean	Maximal	Mean	Maximal
Percentile 5	0.493	0.587	0.481	0.564	0.493	0.606	0.405	0.475
Percentile 10	0.515	0.619	0.504	0.586	0.536	0.651	0.429	0.511
Percentile 25	0.565	0.675	0.551	0.643	0.595	0.730	0.483	0.575
Percentile 50	0.620	0.741	0.617	0.724	0.680	0.837	0.547	0.656
Percentile 75	0.695	0.838	0.701	0.828	0.792	0.966	0.632	0.756
Percentile 90	0.788	0.941	0.793	0.935	0.921	1.146	0.734	0.902
Percentile 95	0.850	1.013	0.861	1.017	1.012	1.289	0.820	0.964

AC, all carotid; CB, carotid bulb; CCA, common carotid artery; ICA, internal carotid artery; IMT, intima-media thickness.

**Table 4**

Percentiles of Mean and Maximal all Carotid, Common Carotid, Carotid Bulb and Internal Carotid Intima-Media Thickness (mm) in Men Free of Cardiovascular Risk Factors (N=306)

	AC IMT		CCA IMT		CB IMT		ICA IMT	
	Mean	Maximal	Mean	Maximal	Mean	Maximal	Mean	Maximal
Percentile 5	0.502	0.599	0.495	0.560	0.527	0.630	0.419	0.498
Percentile 10	0.535	0.635	0.521	0.587	0.559	0.680	0.452	0.533
Percentile 25	0.597	0.699	0.572	0.666	0.640	0.767	0.501	0.595
Percentile 50	0.663	0.787	0.643	0.759	0.740	0.883	0.580	0.686
Percentile 75	0.749	0.883	0.741	0.868	0.870	1.019	0.679	0.813
Percentile 90	0.848	0.992	0.854	0.977	0.990	1.188	0.779	0.922
Percentile 95	0.888	1.079	0.908	1.068	1.086	1.333	0.835	0.990

AC, all carotid; CB, carotid bulb; CCA, common carotid artery; ICA, internal carotid artery; IMT, intima-media thickness.

**Table 5**

Association Between Cardiovascular Risk Factors and Mean and Maximal Carotid Bulb Artery Intima-Media Thickness (mm) by Sex.

	Women				Men			
	Mean CB IMT		Maximal CB IMT		Mean CB IMT		Maximal CB IMT	
	Coefficient (CI 95%)	<i>P</i>	Coefficient (CI 95%)	<i>P</i>	Coefficient (CI 95%)	<i>P</i>	Coefficient (CI 95%)	<i>P</i>
Age	0.69 (0.59 – 0.80)	<.001	0.84 (0.70 – 0.98)	<.001	0.77 (0.66 – 0.87)	<.001	0.97 (0.82 – 1.11)	<.001
Smoker	0.09 (-0.20 – 0.37)	.557	0.28 (-0.09 – 0.66)	.142	0.35 (0.10 – 0.60)	.006	0.33 (-0.01 – 0.68)	.061
Diabetes	-0.05 (-0.43 – 0.34)	.809	0.09 (-0.42 – 0.60)	.717	-0.14 (-0.50 – 0.22)	.452	-0.15 (-0.64 – 0.35)	.558
Pulse pressure	0.16 (0.08 – 0.23)	<.001	0.18 (0.08 – 0.28)	<.001	0.23 (0.15 – 0.32)	<.001	0.32 (0.20 – 0.44)	<.001
Total cholesterol	0.05 (0.02 – 0.07)	.001	0.07 (0.03 – 0.11)	<.001	0.04 (0.01 – 0.07)	.007	0.07 (0.03 – 0.12)	.001
HDL cholesterol	-0.06 (-0.15 – 0.02)	.137	-0.07 (-0.19 – 0.04)	.202	-0.07 (-0.20 – 0.05)	.245	-0.08 (-0.26 – 0.09)	.332
Body mass index	-0.02 (-0.04 – 0.00)	.036	-0.04 (-0.07 – -0.01)	.007	0.00 (-0.03 – 0.03)	.897	-0.02 (-0.07 – 0.02)	.254

CB, carotid bulb; CI, confidence interval; HDL, high density lipoprotein; IMT, intima-media thickness.

Model adjusted for age (10 years), smoker, diabetes, pulse pressure (10 mmHg), total cholesterol (10g/dl), HDL cholesterol (10g/dl) and body mass index.

**Table 6**

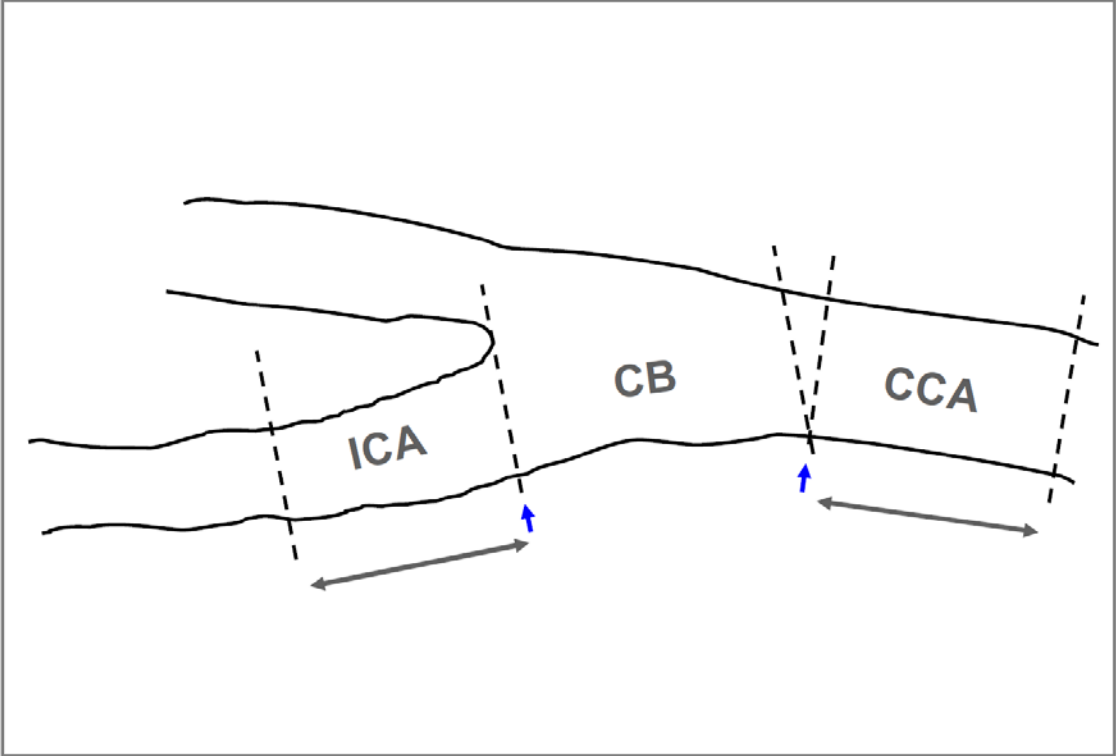
Association Between Cardiovascular Risk Factors and Mean and Maximal Internal Carotid Artery Intima-Media Thickness (mm) by Sex

	Women				Men			
	Mean ICA IMT		Maximal ICA IMT		Mean ICA IMT		Maximal ICA IMT	
	Coefficient (CI 95%)	<i>P</i>	Coefficient (CI 95%)	<i>P</i>	Coefficient (CI 95%)	<i>P</i>	Coefficient (CI 95%)	<i>P</i>
Age	0.37 (0.29 – 0.45)	<.001	0.44 (0.34 – 0.55)	<.001	0.38 (0.30 – 0.46)	<.001	0.44 (0.33 – 0.54)	<.001
Smoker	0.11 (-0.12 – 0.34)	.331	0.21 (-0.07 – 0.50)	.146	0.05 (-0.15 – 0.26)	.616	0.09 (-0.17 – 0.35)	.507
Diabetes	-0.06 (-0.37 – 0.25)	.704	0.00 (-0.39 – 0.39)	.999	-0.20 (-0.48 – 0.09)	.179	-0.27 (-0.64 – 0.10)	.146
Pulse pressure	0.04 (-0.02 – 0.10)	.156	0.05 (-0.03 – 0.13)	.204	0.13 (0.06 – 0.19)	<.001	0.15 (0.07 – 0.24)	.001
Total cholesterol	0.02 (-0.01 – 0.04)	.152	0.02 (-0.01 – 0.05)	.184	0.04 (0.01 – 0.06)	.004	0.06 (0.03 – 0.09)	<.001
HDL cholesterol	-0.05 (-0.11 – 0.02)	.193	-0.07 (-0.15 – 0.02)	.134	-0.13 (-0.22 – -0.03)	.009	-0.15 (-0.27 – -0.02)	.021
Body mass index	0.01 (-0.01 – 0.03)	.334	0.01 (-0.01 – 0.03)	.536	0.00 (-0.03 – 0.02)	.805	-0.01 (-0.04 – 0.02)	.595

CI, confidence interval; HDL, high density lipoprotein; ICA, internal carotid artery; IMT, intima-media thickness.

Model adjusted for age (10 years), smoker, diabetes, pulse pressure, total cholesterol (10g/dl), HDL cholesterol (10g/dl) and body mass index

**Figure 1.** Images of carotid arterial wall segments acquired bilaterally in subjects



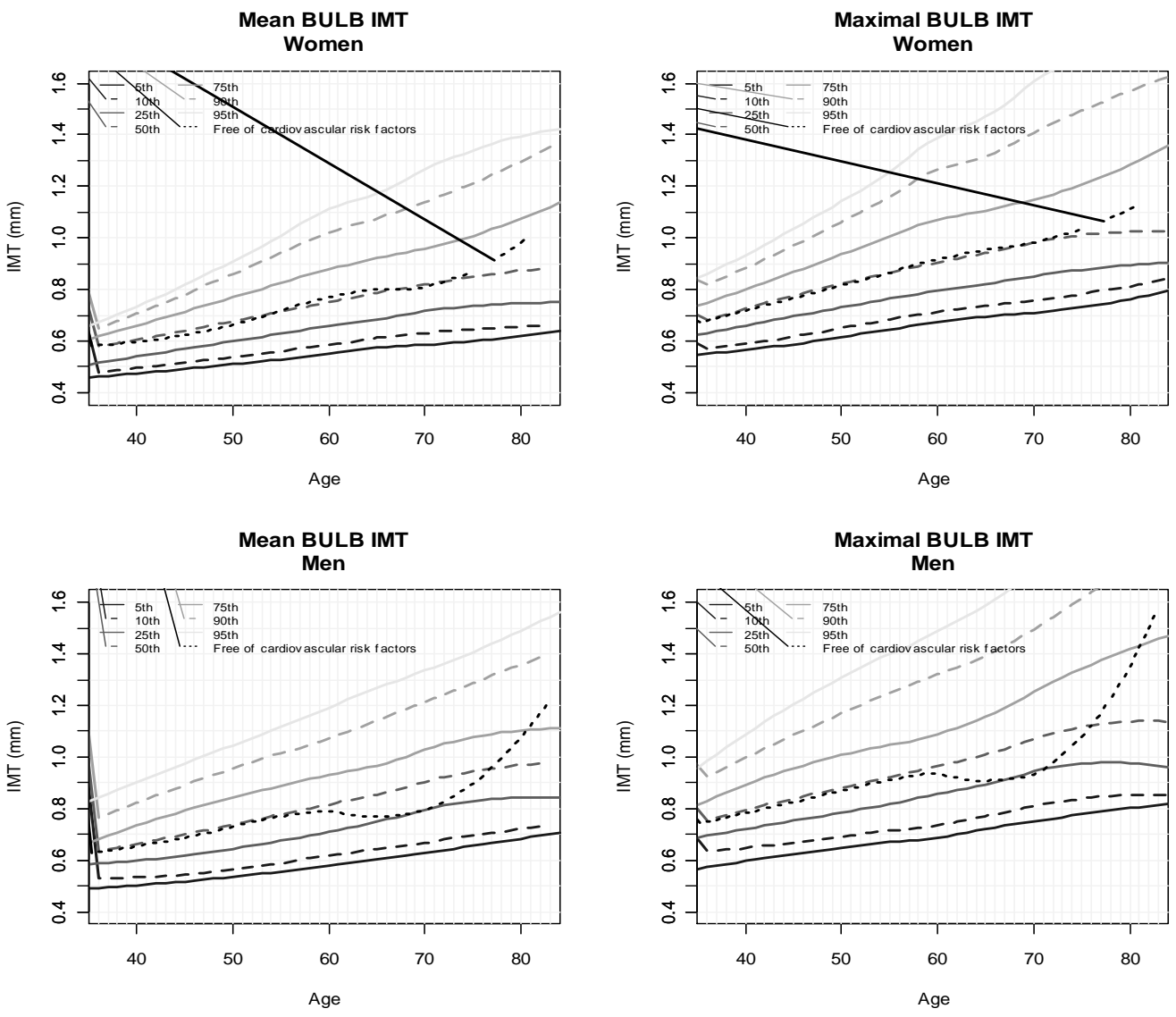
Landmarks are indicated by arrows.

CB, carotid bulb; CCA, common carotid artery; ICA, internal carotid artery



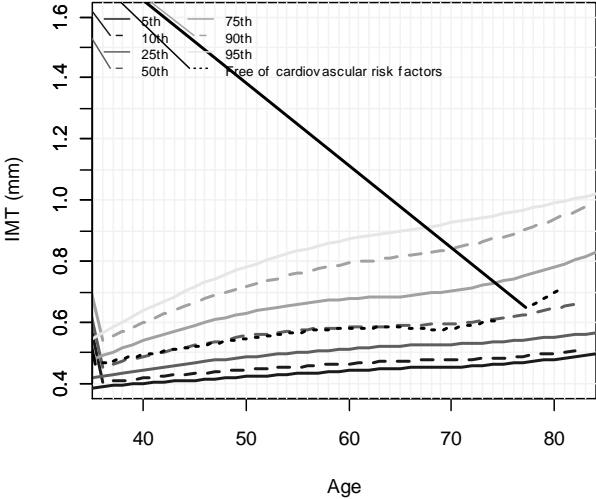
**Figure 2.** Percentiles (5, 10, 25, 50, 75, 90, 95) of mean and maximal internal carotid intima-media thickness (mm) (Panel A) and carotid bulb intima-media thickness (mm) (Panel B) stratified by sex and age. ICA, internal carotid artery; IMT, intima-media thickness.

Panel A.

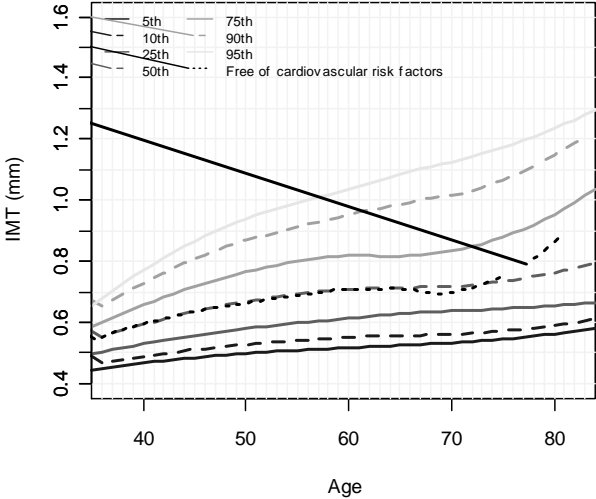


Panel B

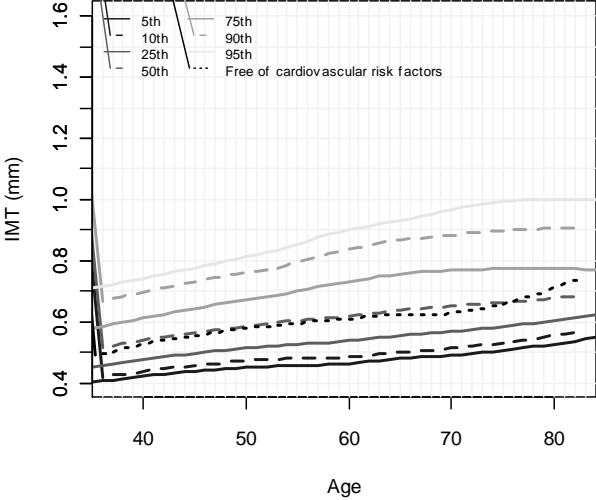
**Mean ICA IMT  
Women**



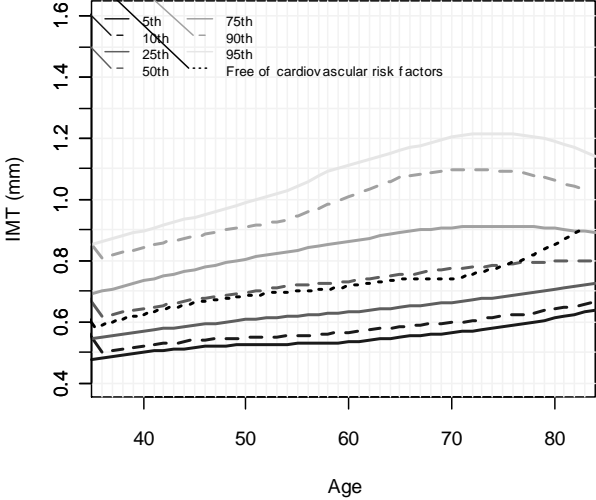
**Maximal ICA IMT  
Women**



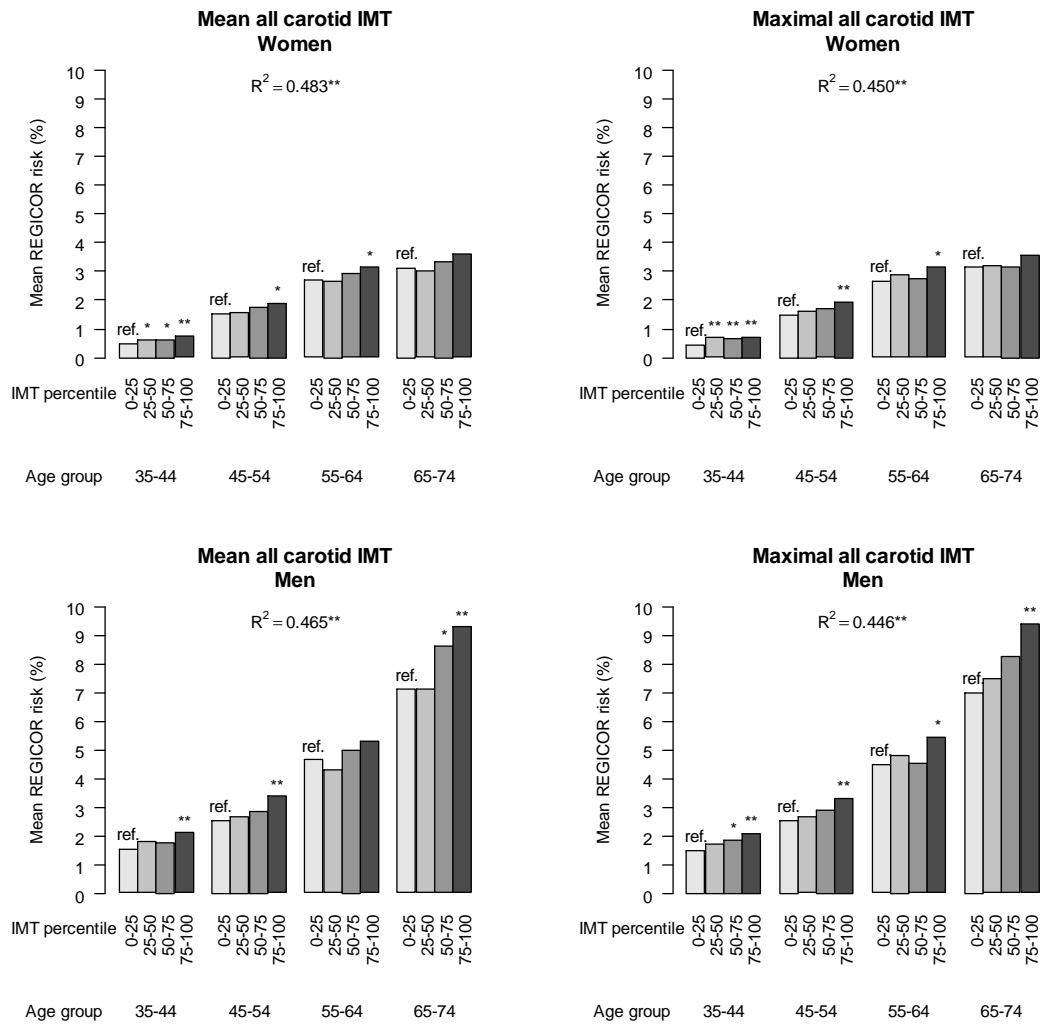
**Mean ICA IMT  
Men**



**Maximal ICA IMT  
Men**



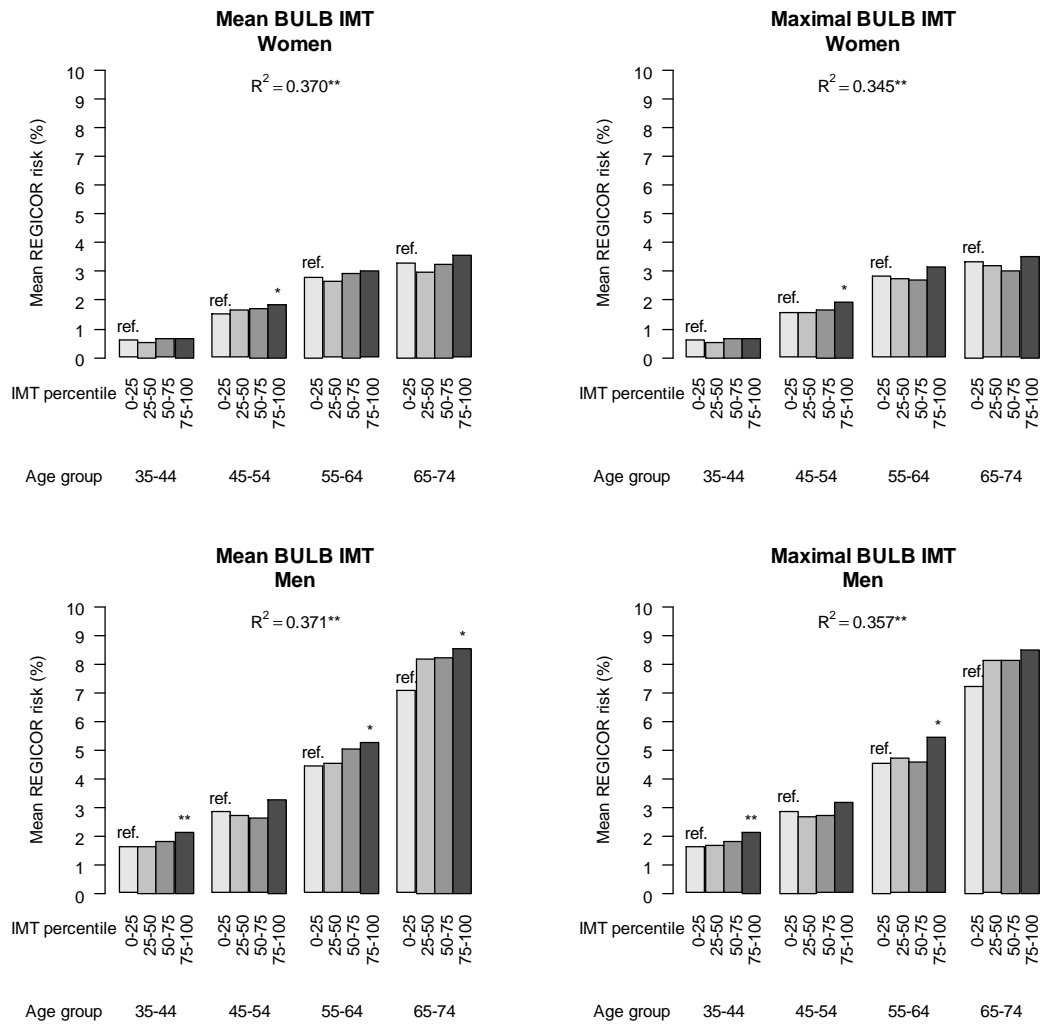
**Figure 3.** Quartiles of mean and maximal all carotid intima-media thickness and coronary risk stratified by sex and age.



IMT, intima-media thickness

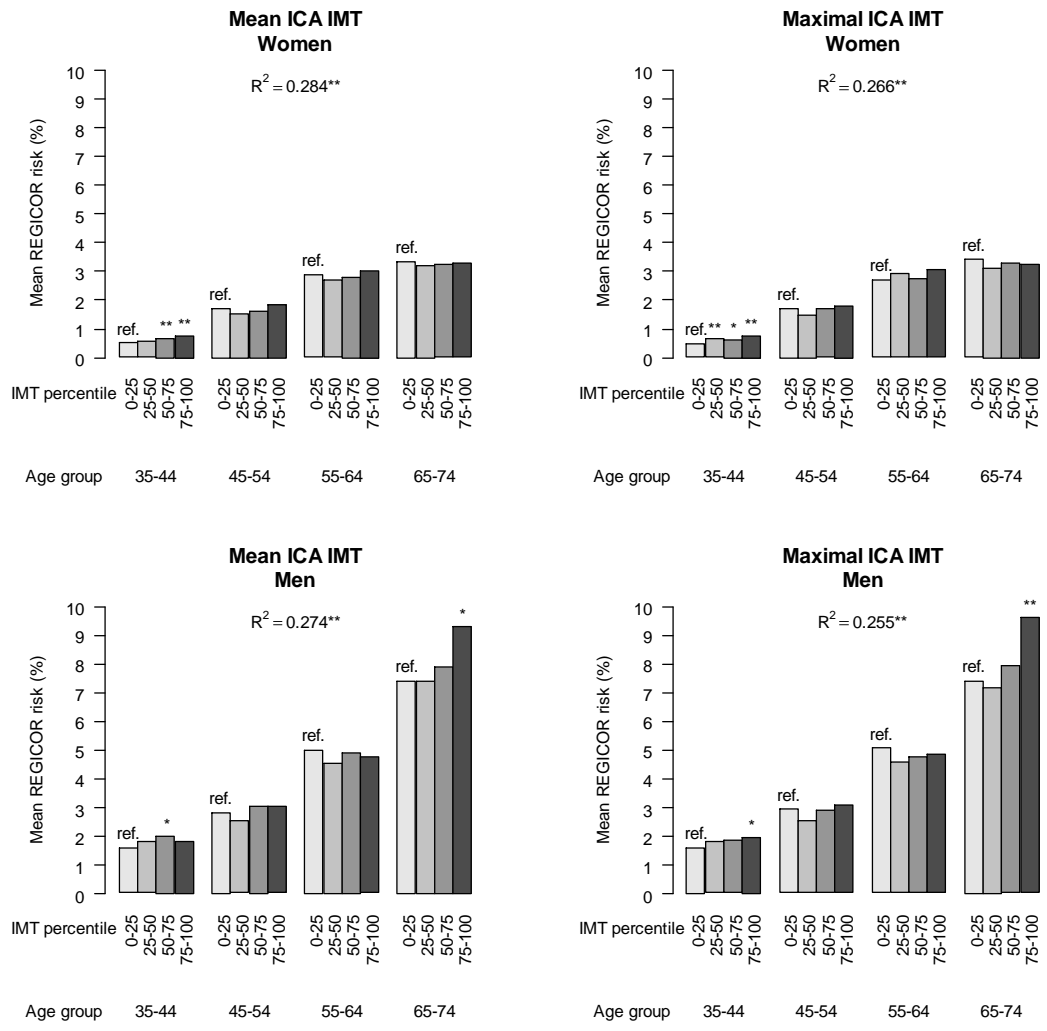
\* p-value <0.05  
 \*\* p-value <0.001.

**Figure 4.** Quartiles of mean and maximal carotid bulb intima-media thickness and coronary risk stratified by sex and age.



IMT, intima-media thickness  
 \* p-value < 0.05.  
 \*\* p-value < 0.001.

**Figure 5.** Quartiles of mean and maximal internal carotid intima-media thickness and coronary risk stratified by sex and age.



ICA, internal carotid artery; IMT, intima-media thickness

\*p-value <0.05.  
 \*\*p-value <0.001