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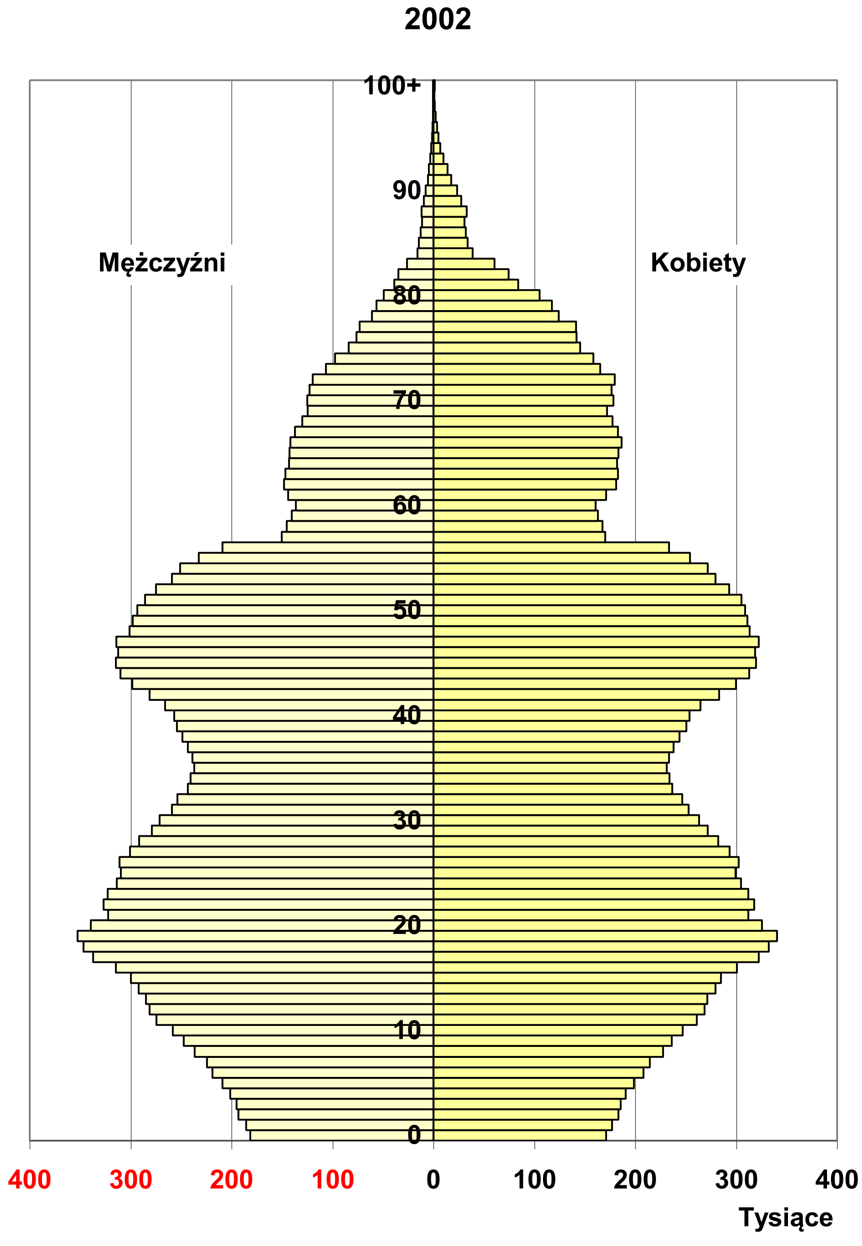
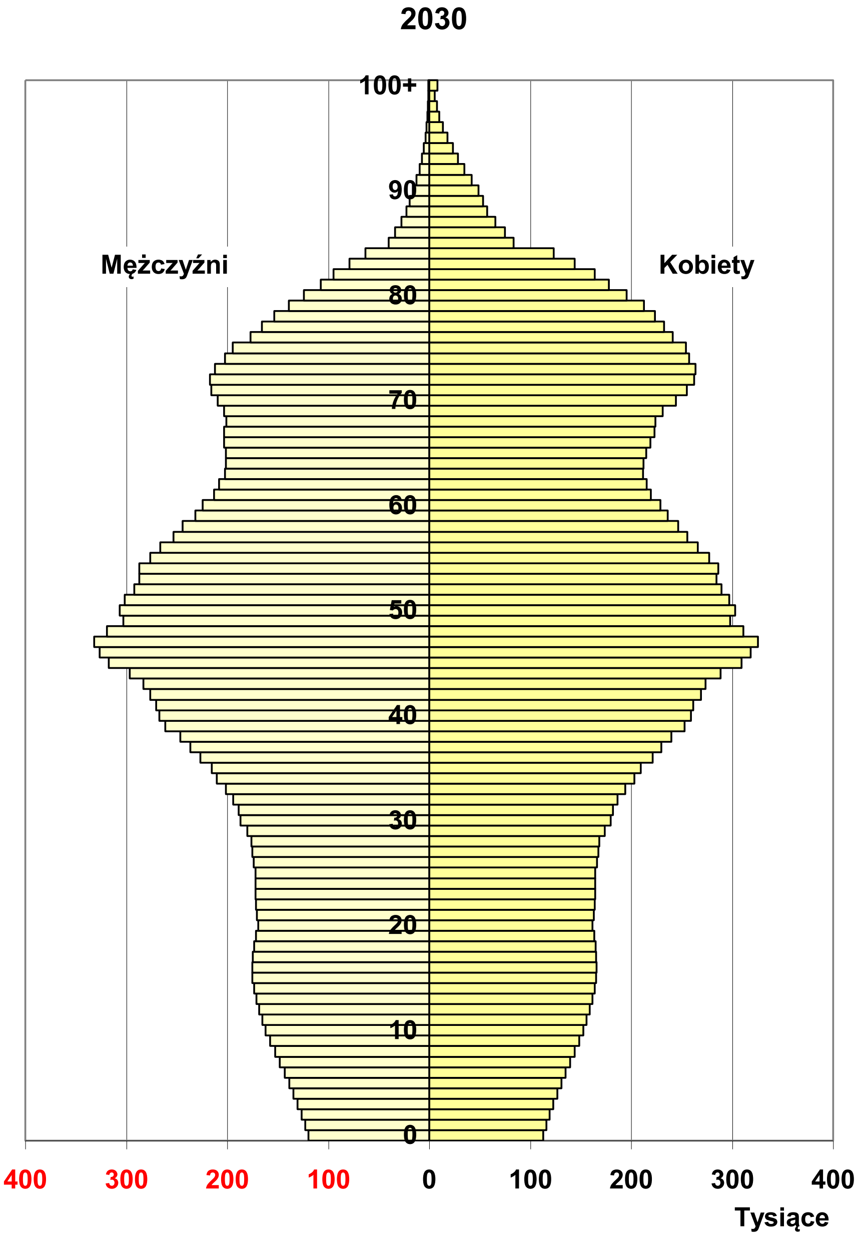
Screening for cardiovascular disease in the elderly

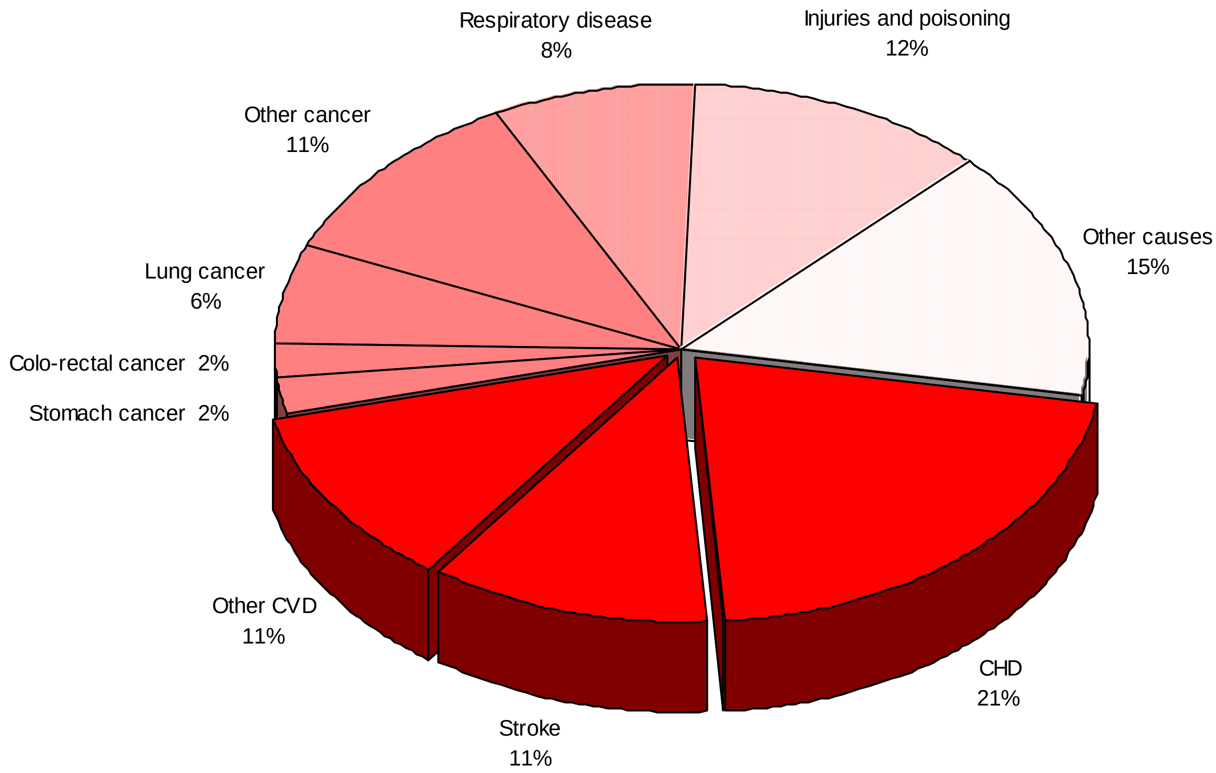
EuroPRevent 2010 Prague

Population pyramid of Poland 2002 and 2030





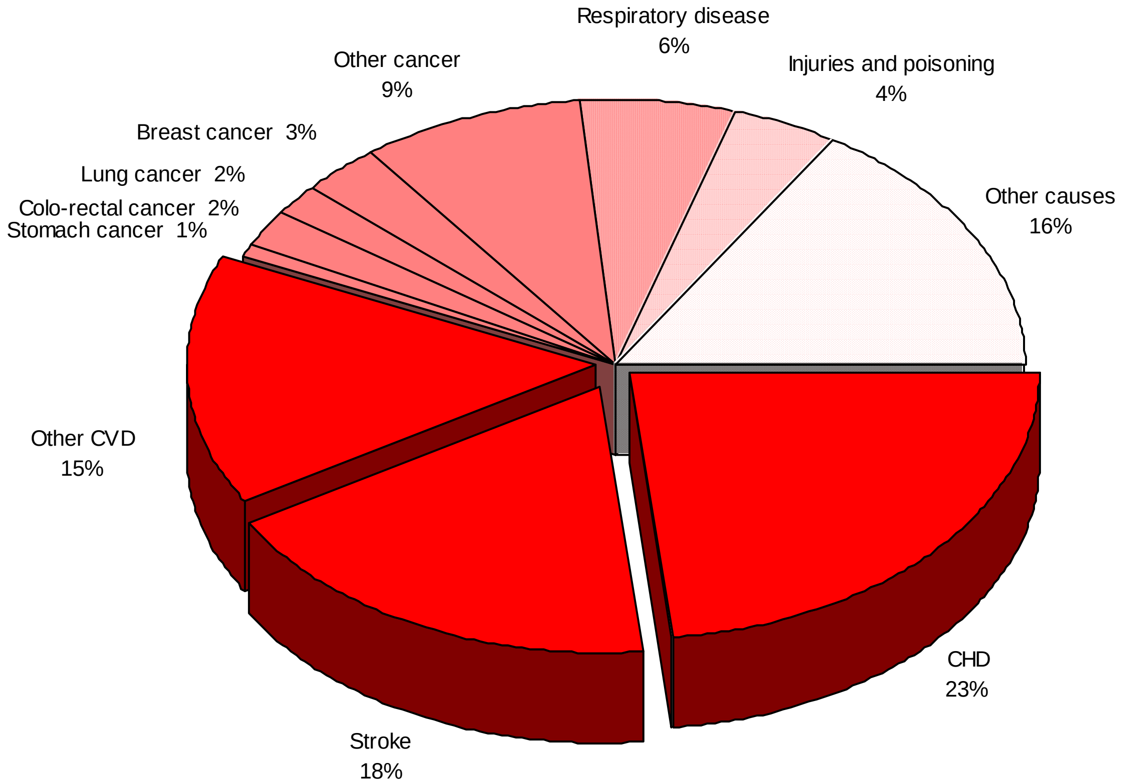
Deaths by cause, men, latest available year, Europe



World Health Organization (2004)

www.heartstats.org

Deaths by cause, women, latest available year, Europe



World Health Organization (2004)

www.heartstats.org

Screening for cardiovascular disease

Cardiovascular risk assessment:

- diet, smoking status, family history,
- fasting lipids (TC, triglycerides, HDL cholesterol, LDL Cholesterol, TC/HDL ratio)
- glucose
- blood pressure
- weight, height, waist and hip circumference (BMI, WHR)
- blood count, electrolytes, creatinine, eGFR, microalbuminuria

Age	Systolic blood pressure (mmHg)	Women Non-smoker 4	5	6	7	8	Women Smoker 4	5	6	7	8	Men Non-smoker 4	5	6	7	8	Men Smoker 4	5	6	7	8
65	180	7	8	9	10	12	13	15	17	19	22	14	16	19	22	26	26	30	35	41	47
	160	5	5	6	7	8	9	10	12	13	16	9	11	13	15	16	18	21	25	29	34
	140	3	3	4	5	6	6	7	8	9	11	6	8	9	11	13	13	15	17	20	24
	120	2	2	3	3	4	4	5	5	6	7	4	5	6	7	9	9	10	12	14	17
60	180	4	4	5	6	7	8	9	10	11	13	9	11	13	15	18	18	21	24	28	33
	160	3	3	3	4	5	5	6	7	8	9	6	7	9	10	12	12	14	17	20	24
	140	2	2	2	3	3	3	4	5	5	6	4	5	6	7	9	8	10	12	14	17
	120	1	1	2	2	2	2	3	3	4	4	3	3	4	5	6	6	7	8	10	12
55	180	2	2	3	3	4	4	5	5	6	7	6	7	8	10	12	12	13	16	19	22
	160	1	2	2	2	3	3	3	4	4	5	4	5	6	7	8	8	9	11	13	16
	140	1	1	1	1	2	2	2	2	3	3	3	3	4	5	6	5	6	8	9	11
	120	1	1	1	1	1	1	1	2	2	2	2	2	3	3	4	4	4	5	6	8
50	180	1	1	1	2	2	2	2	3	3	4	4	4	5	6	7	7	8	10	12	14
	160	1	1	1	1	1	1	2	2	2	3	2	3	3	4	5	5	6	7	8	10
	140	0	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3	4	5	6	7
	120	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3	4	5
40	180	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	3	3	4
	160	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2	3
	140	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	2
	120	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Cholesterol (mmol/L)

150 200 250 300 mg/dL

SCORE

15% and over
10% - 14%
5% - 9%
3% - 4%
2%
1%
< 1%

10-year risk of fatal CVD in populations at **high CVD risk**

Investigations which are currently not indicated in the routine assessment of cardiovascular risk:

- homocysteine
- hsCRP
- lipoprotein (a)
- apoA1 and apoB
- uric acid
- insulin
- BNP
- coronary artery calcification (CAC)

CRP concentration has continuous associations with the risk of coronary heart disease, ischaemic stroke, vascular mortality…

Emerging Risk Factors Collaboration, Kaptoge S, Di Angelantonio E, Lowe G, Pepys MB, Thompson SG, Collins R, Danesh J. C-reactive protein concentration and risk of coronary heart disease, stroke, and mortality: an individual participant meta-analysis. Lancet. 2010 Jan 9;375(9709):132-40.

Screening for cardiovascular disease in the elderly

Current CVD risk profile assessment tools:

modest 10-year risk in young or middle-aged subject

usually evolves into a high risk in an older individual

Currrently available risk prediction tools are valid up to 65-80 years of age

Current risk estimation systems vary in the age ranges to which they apply.

Most can be used up to age of 75 years (Framingham, ASSIGN – SCORE, QRISK2, PROCAM).

WHO/ISH and Reynolds Risk Score can be used up to age of 80 years.

SCORE function concentrates on the middle-aged group and is only recommended for use in the 40- to 65-year age range.

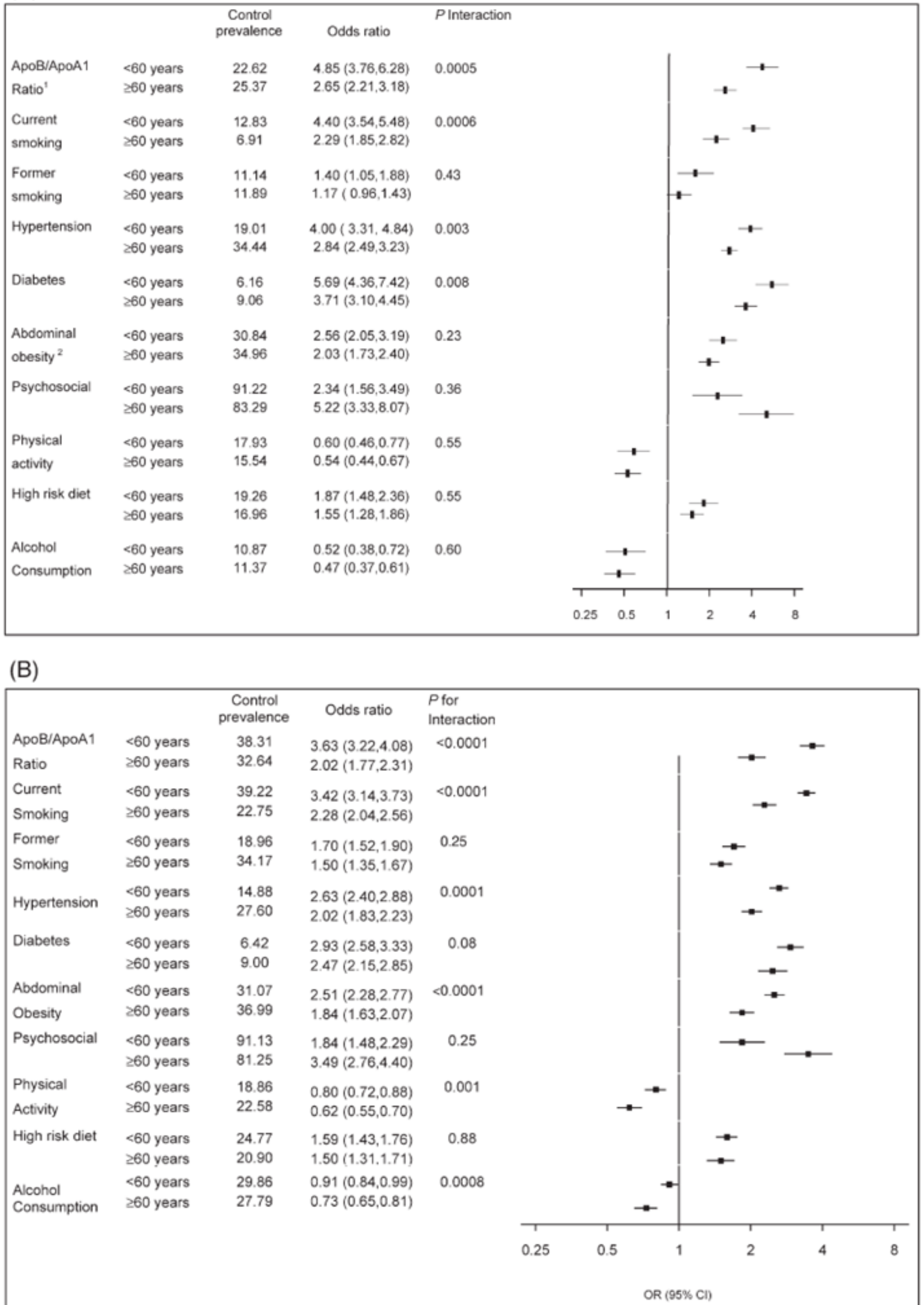
Cooney et al. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk: A Review for Clinicians. JACC 2009.

Most of these systems were derived from cohorts of primarily middle-aged people

- the use of risk estimation systems for subjects aged 65 and more is problematic.

Cooney et al. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk: A Review for Clinicians. JACC 2009.

(A)



(*A*) The impact of risk factors in younger vs. older women. (*B*) The impact of risk factors in younger vs. older men. ApoB/A-1 ratio comparison of the upper tertile to the lowest tertile. Abdominal obesity: comparison of the sex-specific upper tertile the lowest tertile of waist to hip ratio. Psychosocial stress: individuals with at least one of the five psychosocial stress component factors [i.e. depression, global stress, financial stress, locus of control, or other stresses (including separation, job loss, and family conflict)]. High risk diet: comparison of the top quartile to the bottom quartile

Odds ratios for myocardial infarction in patients older and younger than 60 years from the INTERHEART study.
Anand et al. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. Eur Heart J 2008;29:932-940

In the INTERHEART study, hypertension, smoking, dyslipidemia, and diabetes remained significant risk factors for myocardial infarction in the >60 years age group but with significantly lower hazard ratios than for those in the <60 years age group.

Conversely, in men >60 years of age, moderate alcohol consumption and physical activity became more important protective factors.

Anand et al. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. Eur Heart J 2008;29:932-940

Several recent studies have shown a significant improvement in discrimination of risk estimation systems in the elderly with the addition of a range of biomarkers including interleukin 6, CRP, troponin I, N-terminal pro–B-type natriuretic peptide, cystatin C, and carotid plaque burden.

Cooney et al. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk: A Review for Clinicians. JACC 2009.

Table 3. C Statistic for Cox Regression Models Predicting Death from Cardiovascular Causes and from All Causes in the Whole Sample and in the Subsample without Cardiovascular Disease at Baseline.*

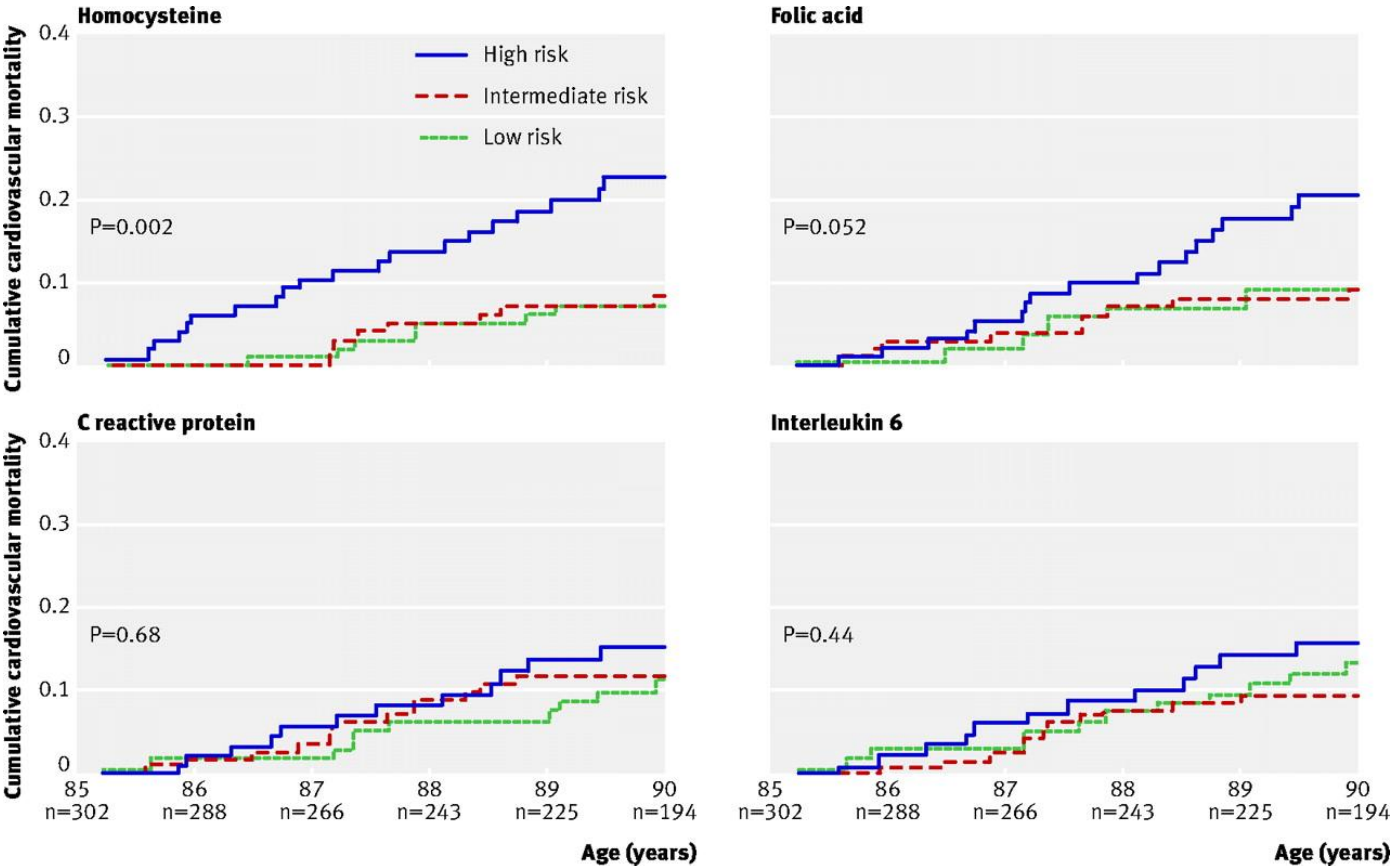
Risk Factors and Biomarkers	C Statistic for Death from Cardiovascular Causes	P Value†	C Statistic for Death from All Causes	P Value†
Whole sample				
Established risk factors	0.664	Referent	0.604	Referent
Established risk factors plus troponin I	0.715	0.002	0.634	0.009
Established risk factors plus NT-pro-BNP	0.749	<0.001	0.657	<0.001
Established risk factors plus cystatin C	0.691	0.07	0.626	0.03
Established risk factors plus C-reactive protein	0.689	0.07	0.636	0.008
Established risk factors plus all biomarkers	0.766	<0.001	0.676	<0.001
Estimated difference with the addition of all biomarkers (95% CI)	0.102 (0.056 to 0.147)	<0.001	0.072 (0.041 to 0.104)	<0.001
Participants without CVD at baseline				
Established risk factors	0.688	Referent	0.638	Referent
Established risk factors plus troponin I	0.716	0.15	0.640	0.90
Established risk factors plus NT-pro-BNP	0.722	0.20	0.653	0.32
Established risk factors plus cystatin C	0.700	0.45	0.649	0.38
Established risk factors plus C-reactive protein	0.715	0.20	0.663	0.11
Established risk factors plus all biomarkers	0.748	0.03	0.668	0.09
Estimated difference with the addition of all biomarkers (95% CI)	0.059 (0.007 to 0.112)	0.03	0.030 (−0.005 to 0.064)	0.09

* Established risk factors included age at baseline (continuous variable), systolic blood pressure (continuous variable), use or nonuse of antihypertensive treatment (binary variable), total cholesterol (continuous variable), high-density lipoprotein cholesterol (continuous variable), use or nonuse of lipid-lowering treatment (binary variable), presence or absence of diabetes (binary variable), smoking status (binary variable), and body-mass index (continuous variable). The biomarkers were modeled as continuous variables. CVD denotes cardiovascular disease, and NT-pro-BNP N-terminal pro–brain natriuretic peptide.

† P values are for the comparison with the model with established risk factors.

Zethelius B., Berglund L., Sundstrom J., et al. Use of multiple biomarkers to improve the prediction of death from cardiovascular causes, *N Engl J Med*, Volume: 358, (2008), pp. 2107--2116

Fig 2 Cumulative cardiovascular mortality depending on tertiles of risk obtained from prediction models using homocysteine, folic acid, C reactive protein and interleukin 6



de Ruijter, W. et al. BMJ 2009;338:a3083

In a prospective population-based cohort study, conventional CV risk factors were documented in 403 independently living elderly men.
Main outcome was CV and all-cause mortality occurring during 4 years of follow-up.
Increasing tertiles of CRP, IL-6, and number of plaques were independently associated with all-cause and CV mortality.
The Framingham PROCAM and a Dutch Risk Function poorly predicted mortality risk, similar or worse than a model using age alone.
CONCLUSION: In the old and very old, IL-6 and number of carotid plaques are powerful predictors of mortality risk in the years to come.
Conventional risk scores seem to perform unsatisfactorily.

Störk S, Feelders RA, van den Beld AW, Steyerberg EW, Savelkoul HF, Lamberts SW, Grobbee DE, Bots ML. Prediction of mortality risk in the elderly. Am J Med. 2006 Jun;119(6):519-25.

The accuracy of risk estimation has been shown to be substantially lower in older persons than in middle-aged persons.

Cooney et al. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk: A Review for Clinicians. JACC 2009.

An extension of the SCORE system is currently being developed. This system, SCORE O.P., will be derived entirely from a cohort >65 years of age at baseline.

Cooney et al. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk: A Review for Clinicians. JACC 2009.

Better risk estimation in the older age group will only partially solve the problem of CVD prevention in the elderly.

Other aspects:

1. **What level to consider high risk? Using the SCORE, all men >65 years of age will have a 10-year CVD risk >5%. Should 10% be considered high risk in older people?**
2. **Disease-specifc or overall health approach?**

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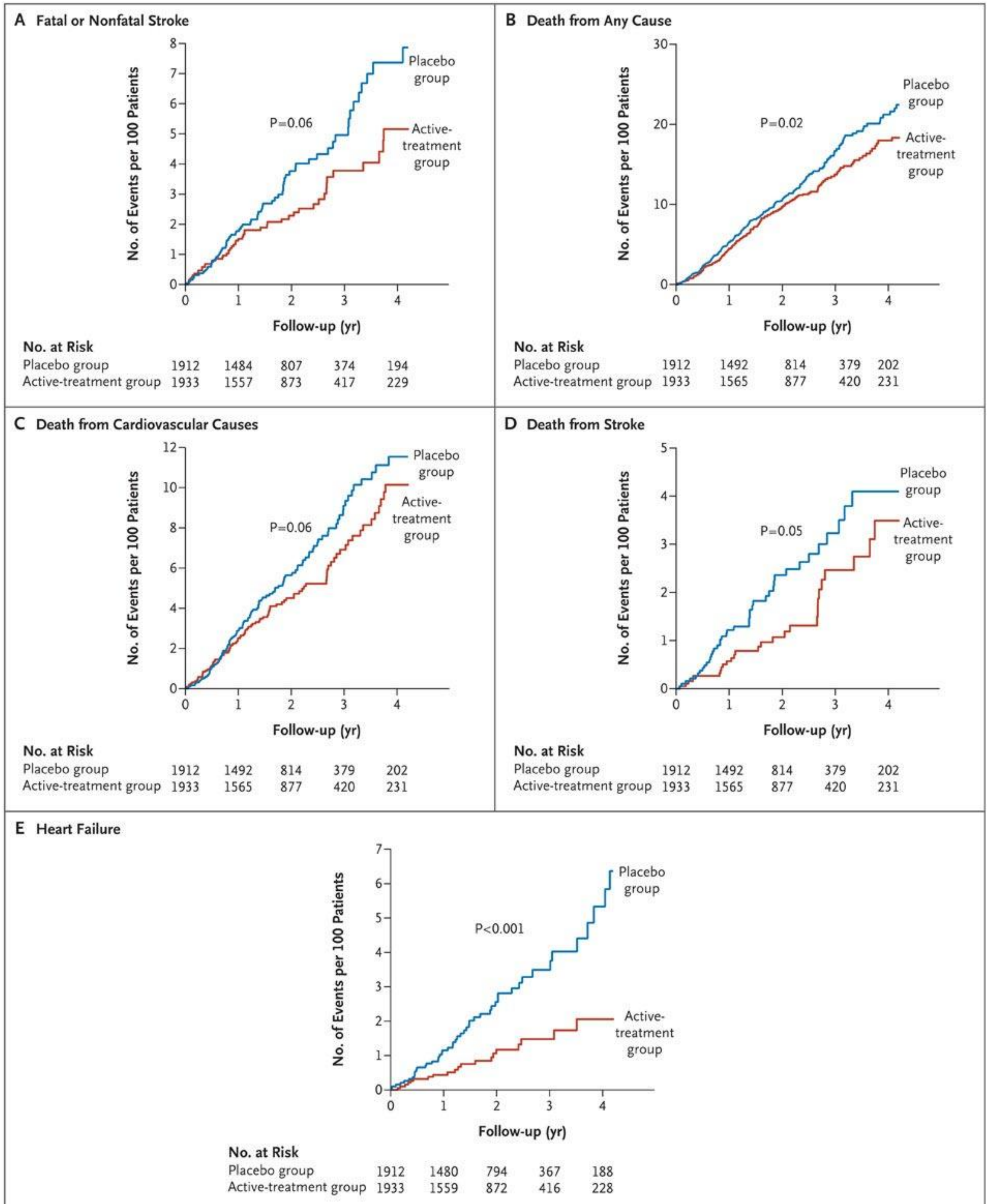
Strategies for CVD risk assessment and allocation of preventive resources

Time-based strategy: uses differences in the absolute numbers of deaths averted and life-years gained – more life-years gained and more treatment at younger people

Risk-based approach: leads to more deaths averted but but fewer life-years gained – focus on elderly subjects



Beckett N., Peters R., Fletcher A.E., et al. Treatment of hypertension in patients 80 years of age or older, *N Engl J Med*, Volume: 358, (2008), pp. 1887--1898

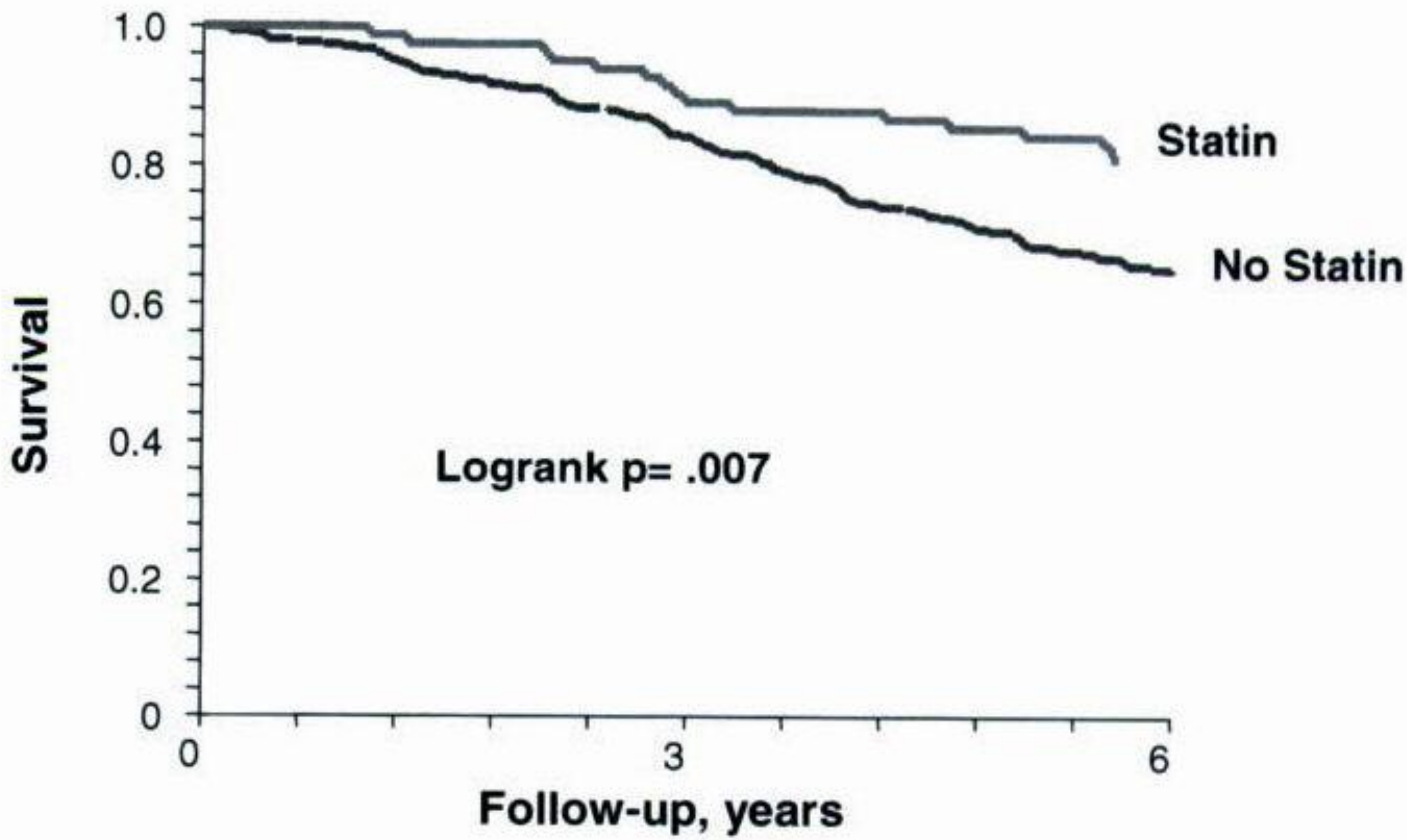


Figure 1. Six-year survival according to the baseline statin use in the DEBATE [Drugs and Evidence Based Medicine in the Elderly] study population (n = 400).

Strandberg TE, Pitkala KH, Tilvis RS, Roberts CGP, Rodriguez A. STATIN TREATMENT IS ASSOCIATED WITH CLEARLY REDUCED MORTALITY RISK OF CARDIOVASCULAR PATIENTS AGED 75 YEARS AND OLDER/AUTHORS' RESPONSE TO LETTER FROM STRANDBERG AND COLLEAGUES J Gerontol Series A : Biological sciences and medical sciences. 2008 Vol. 63A, Iss. 2; pg. 213, 2 pgs

Although recent randomized controlled trials of preventive measures in older and even very old persons have demonstrated that significant benefits can be achieved, it is still uncertain whether risk stratification can assist in targeting these measures toward those who will benefit most, and if so, what threshold is appropriate in this age group.

Cooney et al. Value and Limitations of Existing Scores for the Assessment of Cardiovascular Risk: A Review for Clinicians. JACC 2009.

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2. **Disease-specifc or overall health approach?**

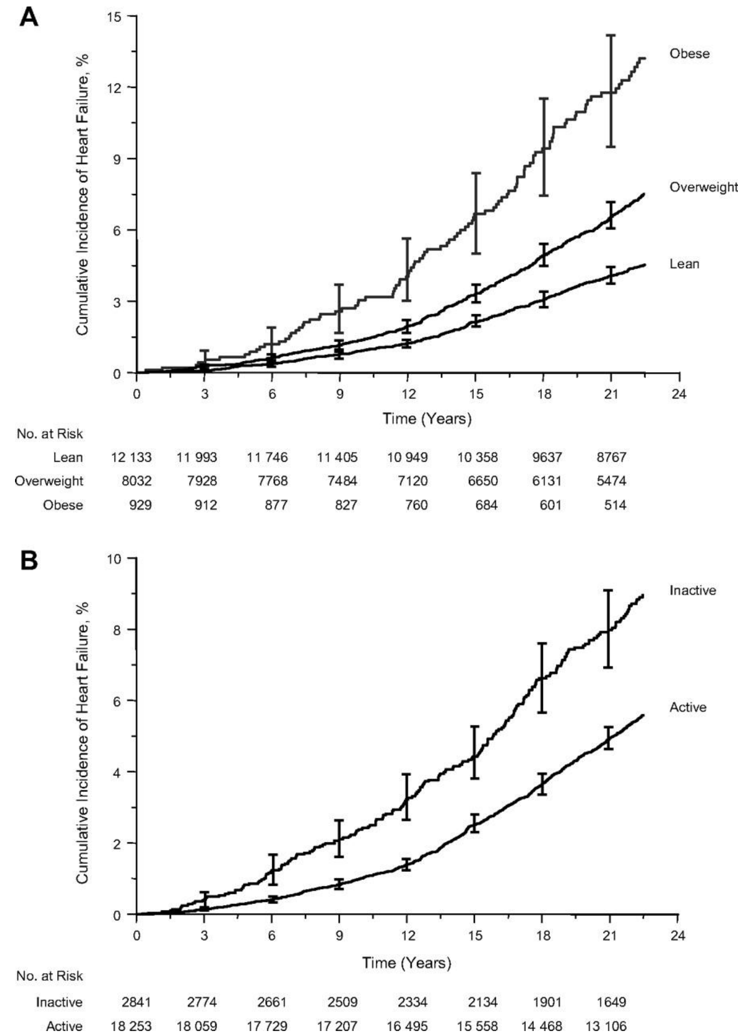
Evidence-based approaches work in discrete conditions, not in individuals with multiple diseases.

Treating the disease may be not always good for the patient with multiple coexisting conditions.

General overweight and general and abdominal obesity are independently associated with an increased risk of HF…

Hu G, Jousilahti P, Antikainen R, Katzmarzyk PT, Tuomilehto J. Joint effects of physical activity, body mass index, waist circumference, and waist-to-hip ratio on the risk of heart failure. Circulation. 2010 Jan 19;121(2):237-44. Epub 2010 Jan 4.

Cumulative incidence of HF according to categories of BMI (A) and vigorous physical activity (B) at the baseline examination



Kenchaiah, S. et al. Circulation 2009;119:44-52

Circulation

However…

Mortality risk was lowest for overweight participants.

These results lend further credence to claims that the BMI thresholds for overweight and obese are overly restrictive for older people. Overweight older people are not at greater mortality risk than those who are normal weight.

Flicker L, McCaul KA, Hankey GJ, Jamrozik K, Brown WJ, Byles JE, Almeida OP. Body mass index and survival in men and women aged 70 to 75. J Am Geriatr Soc. 2010 Feb;58(2):234-41.

In very elderly subjects with diabetes mellitus, increased BMI was associated with reduced mortality risk.

Weiss A, Boaz M, Beloosesky Y, Kornowski R, Grossman E. Body mass index and risk of all-cause and cardiovascular mortality in hospitalized elderly patients with diabetes mellitus. Diabet Med. 2009 Mar;26(3):253-9.

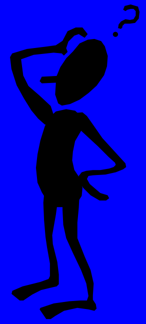
Single disease models should not be applied to preventive treatments in elderly people

Aim: to identify factors which may affect quality or quantity of life

Geriatric population:

risk factors ↔ diseases

prevention ↔ treatment



POLKARD-SENIOR

Pilot study estimating the possibility and efficacy of complex primary and secondary cardiovascular diseases prevention programme in older persons

Fig. 3 Frequency (%) of CAD in various populations of seniors.

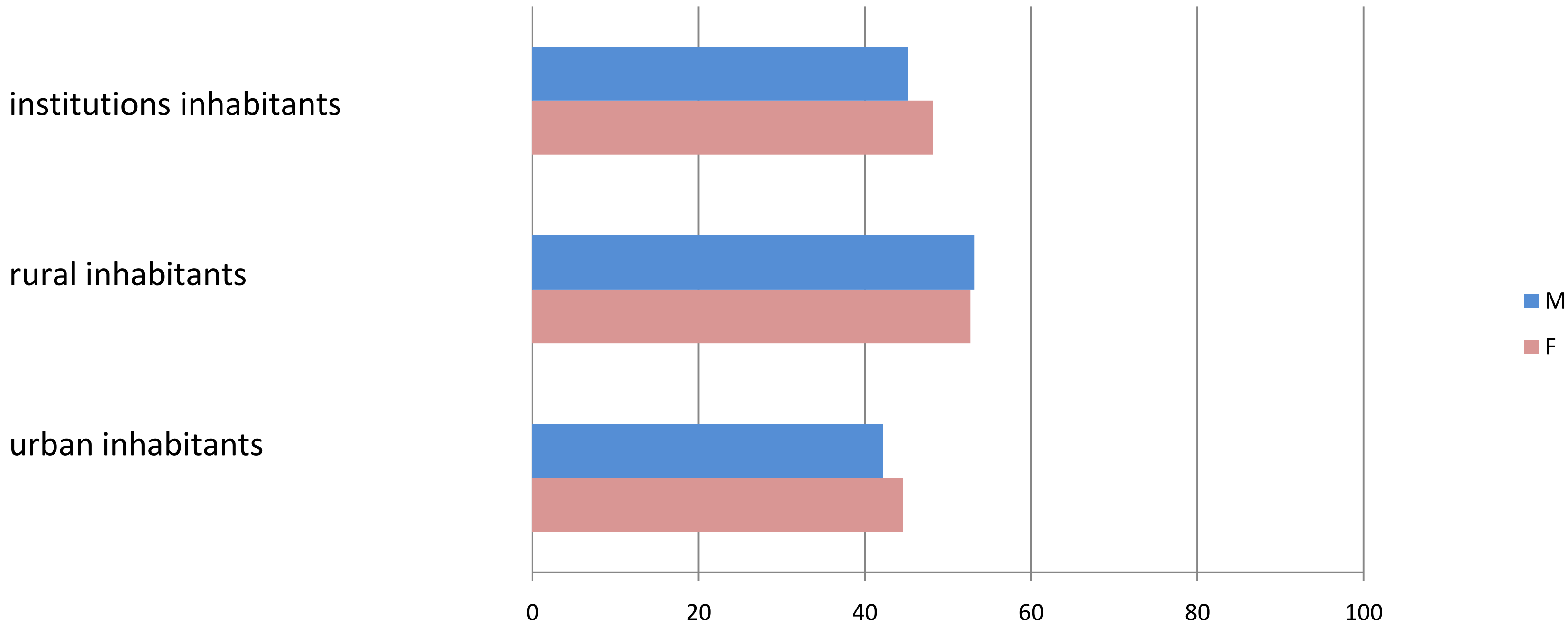


Fig. 2 Occurrence (%) of diabetes mellitus in various populations of seniors.

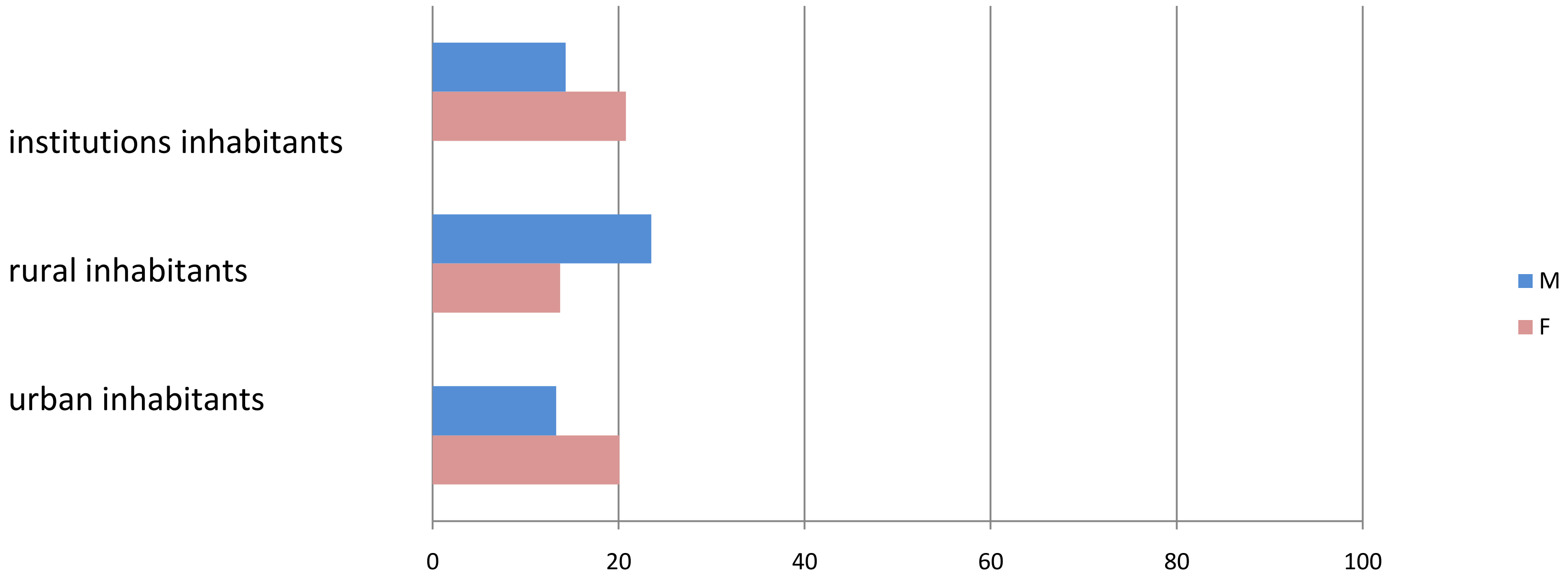


Fig. 5 Frequency (%) of stroke in various populations of seniors.

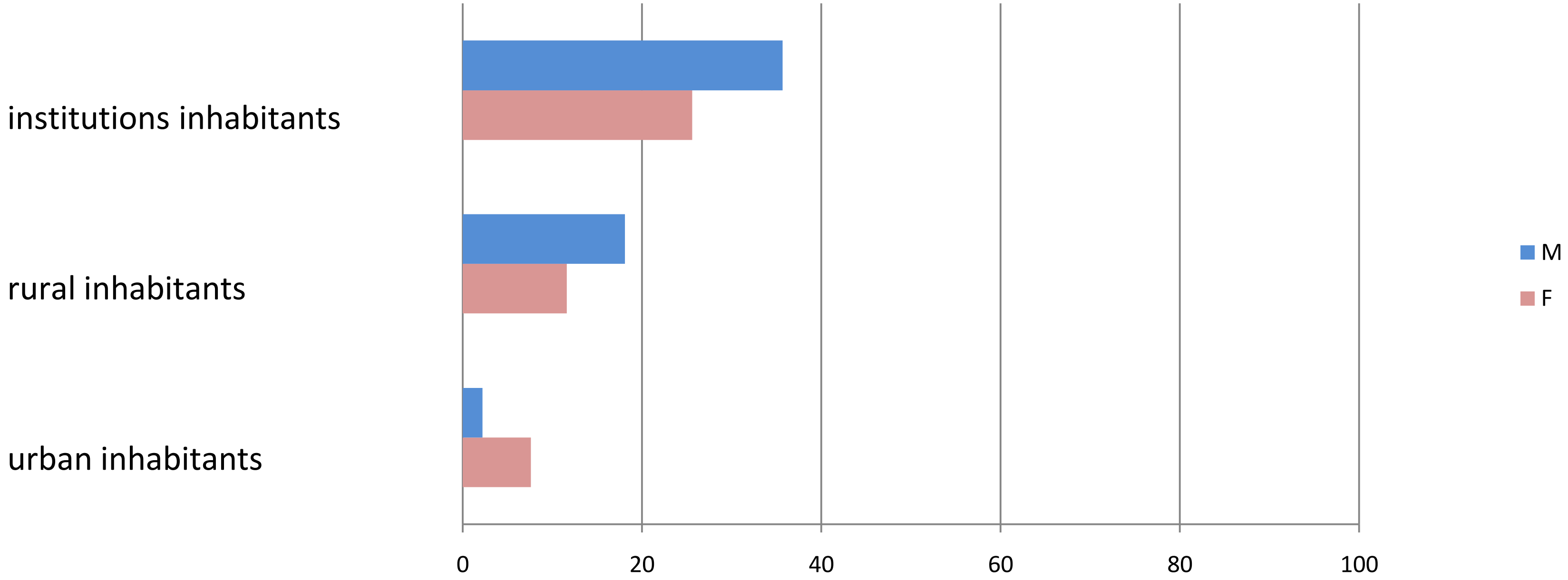
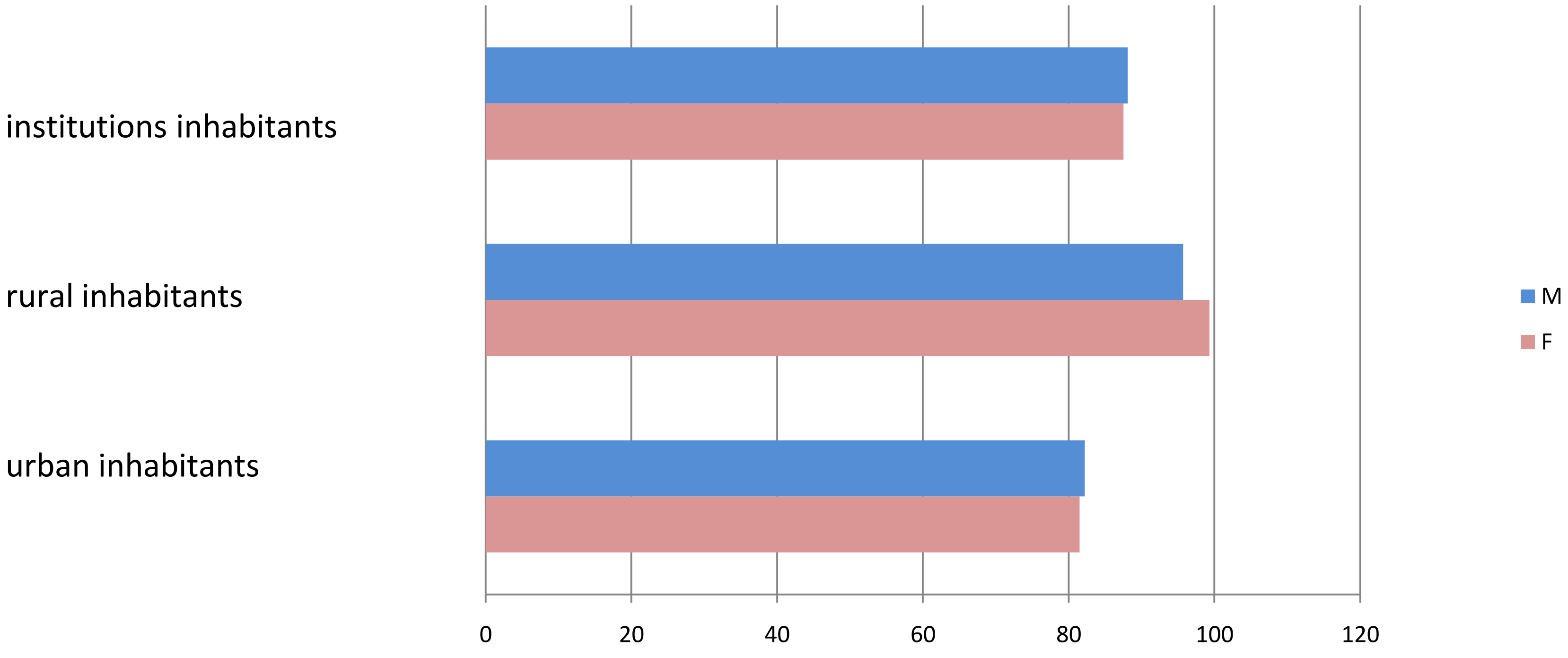


Fig. 1 Prevalence (%) of CVDs in various populations of seniors.



Frequency Ta **hypertension**

	K	M
N	640	
	24,74%	
	37,36%	
T	1073	
	41,48%	
	62,64%	
Column	1713	
Total	66,22%	

Fig. 8 Daily medicaments intake in various populations of seniors.

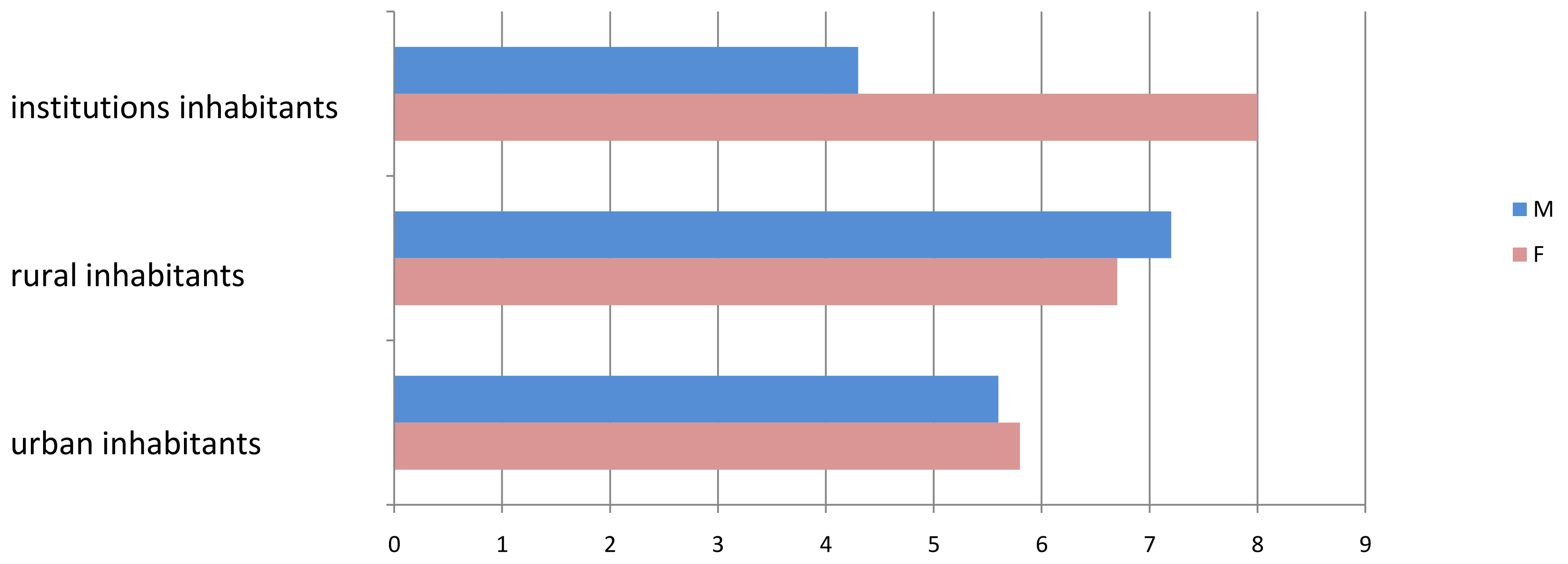


Fig. 8 Occurrence (%) of depression in various populations of seniors.

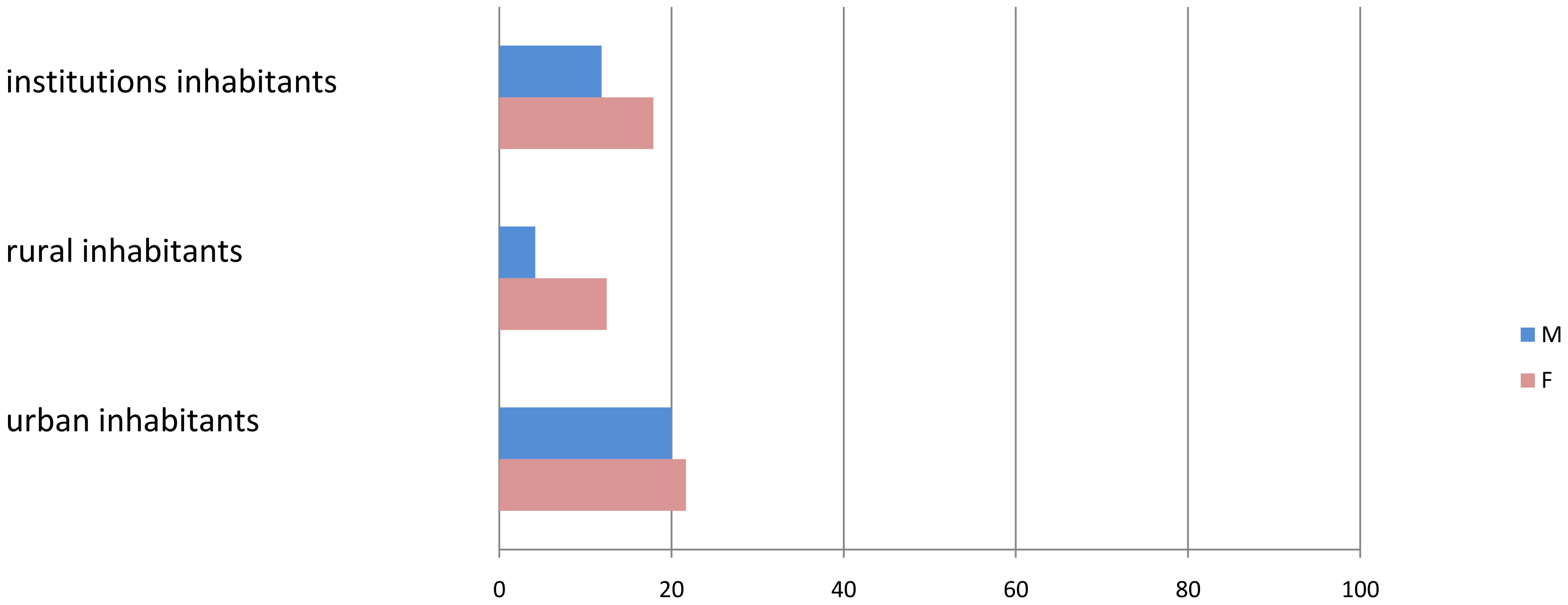
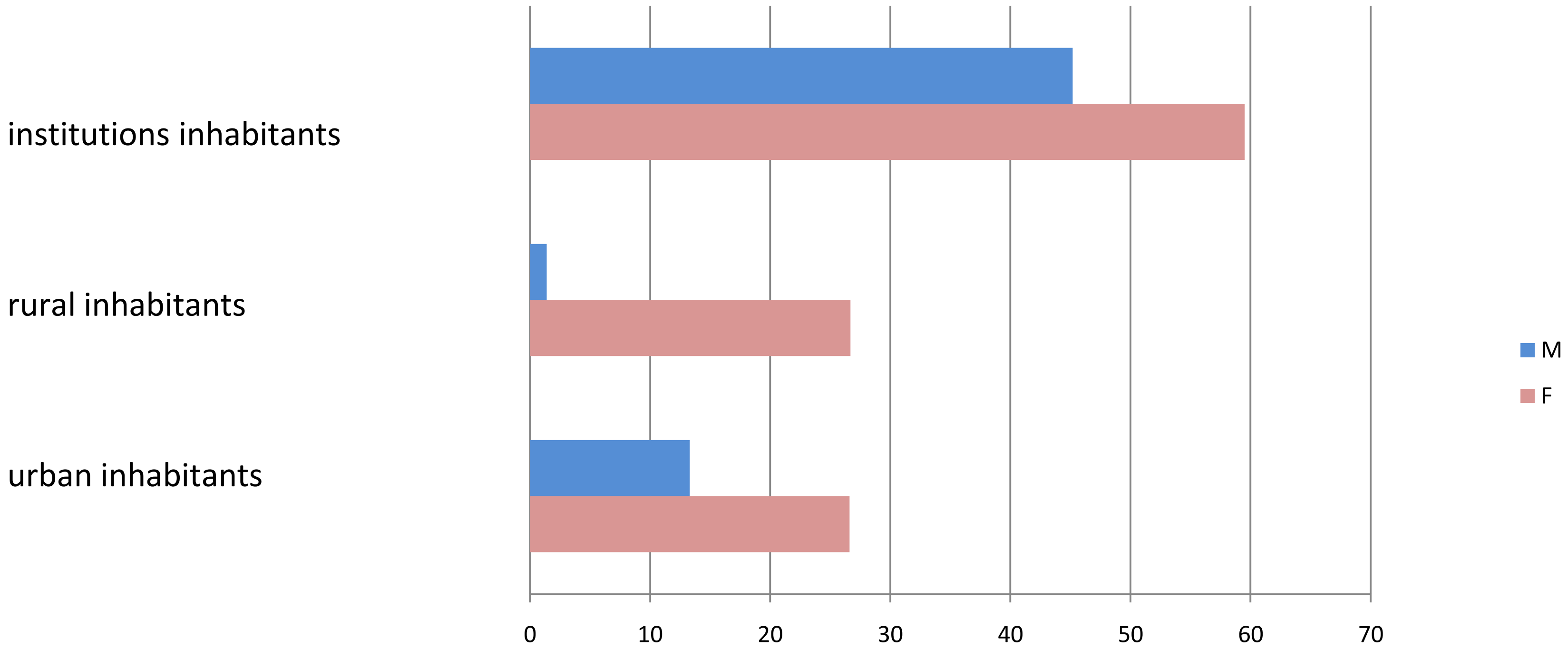
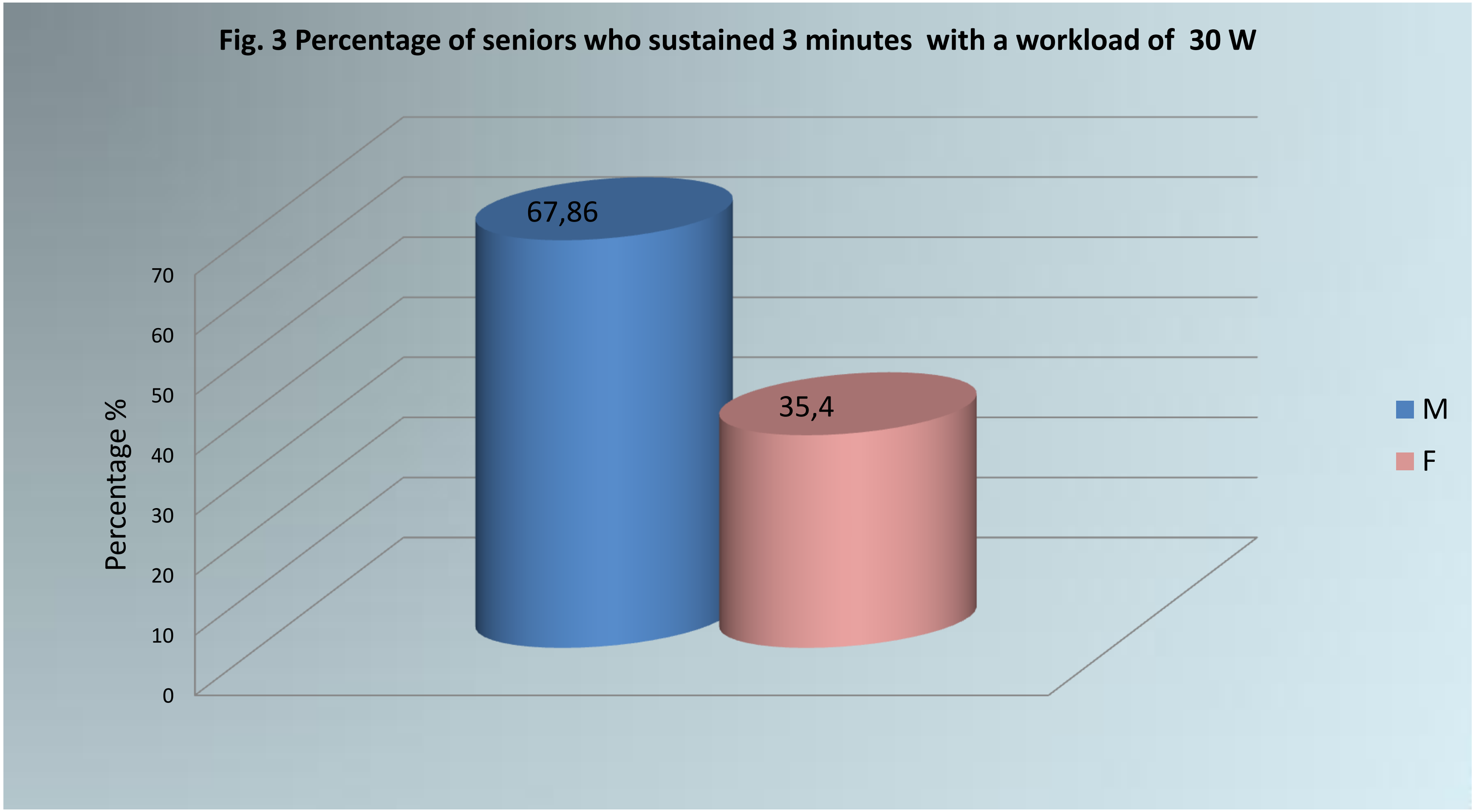


Fig. 9 Occurrence (%) of urinary incontinence in various populations of seniors.



Exercise testing in the elderly (n=429)



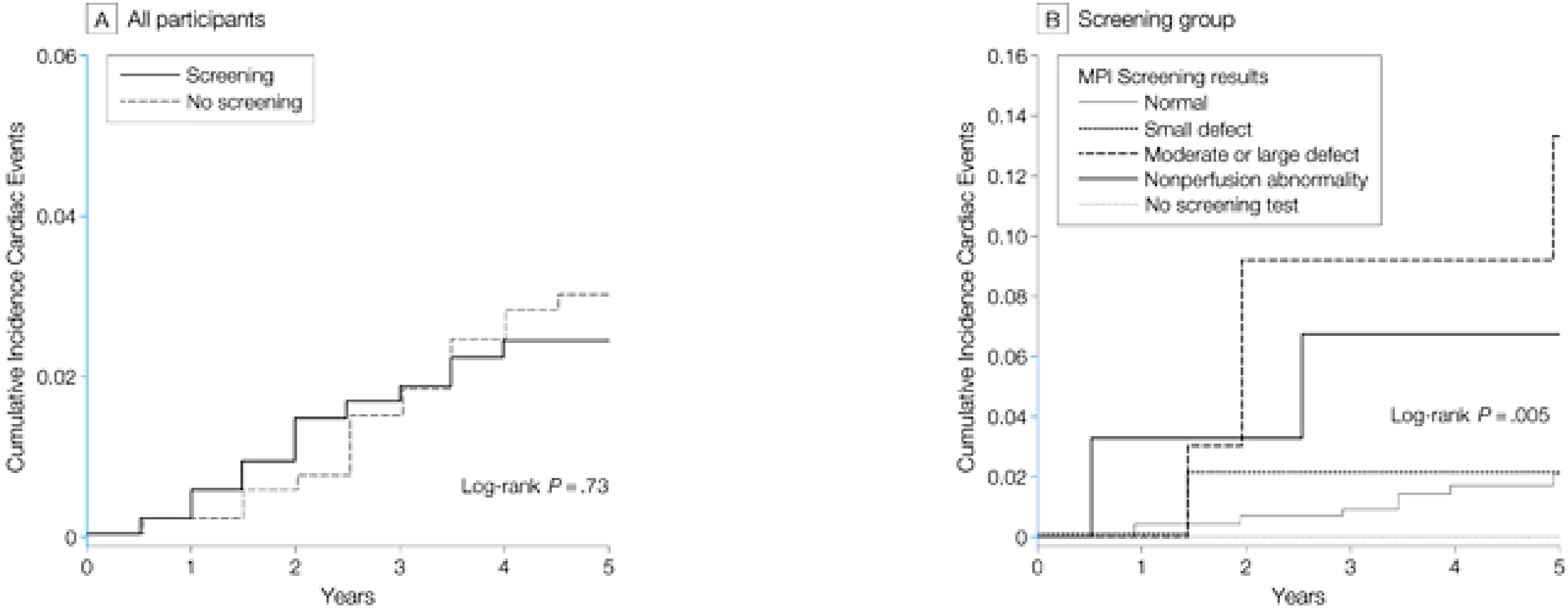
CVD in the elderly

Scope of screening?

Range of intervention?

In a high risk population of patients with diabetes and no symptoms of CAD, the cardiac event rates were not significantly reduced by myocardial perfusion imaging (MPI) screening for myocardial ischemia over 4.8 years.

Young LH et al. Cardiac outcomes after screening for asymptomatic coronary artery disease in patients with type 2 diabetes: the DIAD study: a randomized controlled trial. JAMA. 2009 Apr 15;301(15):1547-55.



No. at risk	0	1	2	3	4	5
No screening	562	557	546	529	499	381
Screening	561	556	546	526	499	390

No. at risk	0	1	2	3	4	5
MPI Screening results						
Normal	409	408	402	389	370	290
Small defect	50	49	48	46	42	32
Moderate or large defect	33	33	32	30	29	22
Nonperfusion abnormality	30	29	29	27	26	20
No screening test	39	37	35	35	34	26

Young LH et al. Cardiac outcomes after screening for asymptomatic coronary artery disease in patients with type 2 diabetes: the DIAD study: a randomized controlled trial. JAMA. 2009 Apr 15;301(15):1547-55.

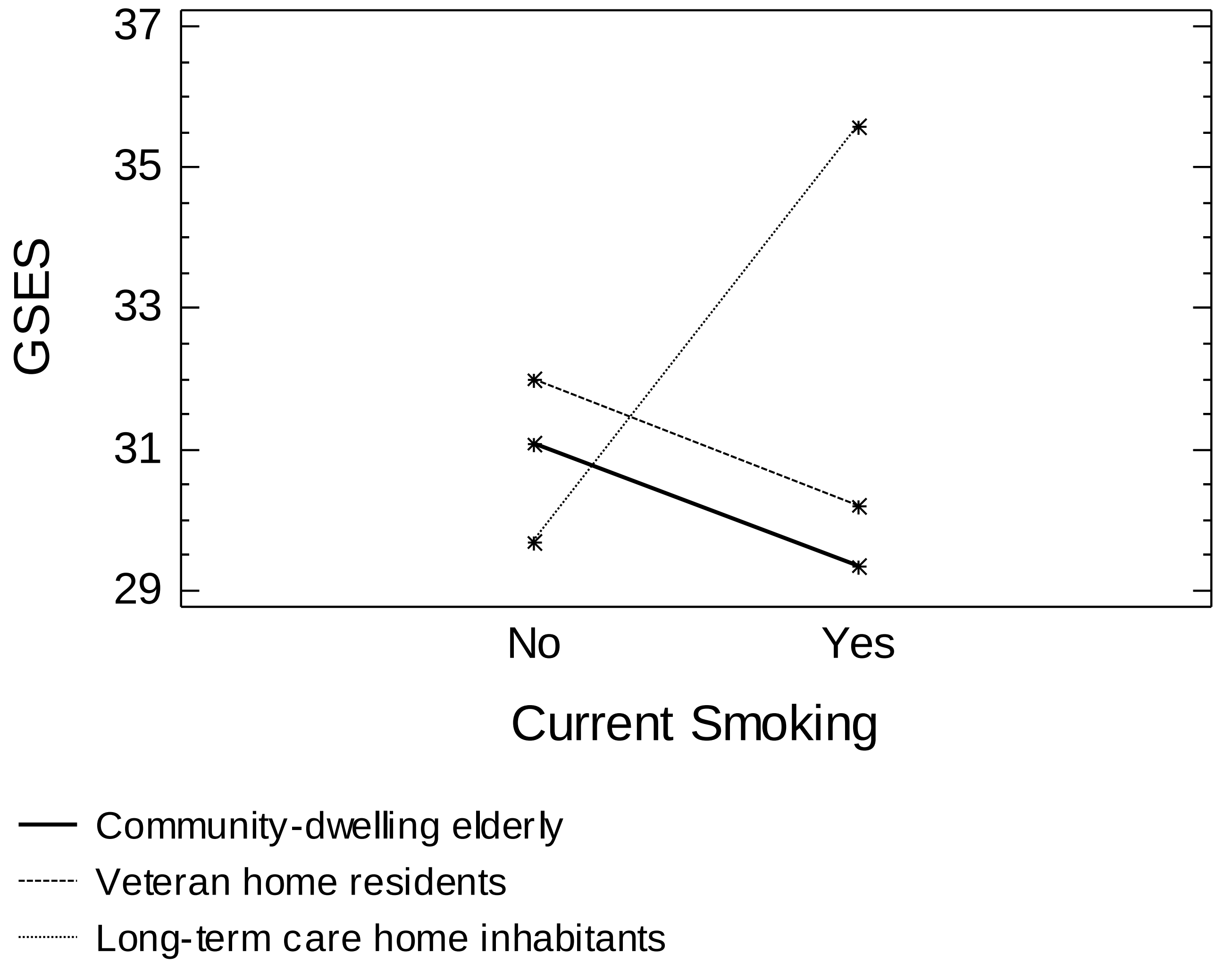
Randomly assigned 2368 patients with both type 2 diabetes and heart disease to undergo either prompt revascularization with intensive medical therapy or intensive medical therapy alone...

At 5 years, rates of survival did not differ significantly between the revascularization group and the medical-therapy group…

BARI 2D Study Group. A randomized trial of therapies for type 2 diabetes and coronary artery disease. N Engl J Med. 2009 Jun 11;360(24):2503-15.

CVD in the elderly

Quality of life



Relationship of GSES to smoking habit in older subjects living in different environments

Kostka & Jachimowicz Qual Life Res 2010

	Community-dwelling without CVD (n=100)	Community-dwelling with CVD (n=100)	Hospitalised with CVD (n=100)	p-value for factor
Mobility no problems, problems (%) Odds ratios (95% confidence intervals)	61, 39 1.00	50, 50 1.56 (0.89-2.74)	38, 62 2.55* (1.44-4.52)	P=0.005
Self-care no problems, problems (%) Odds ratios (95% confidence intervals)	81, 19 1.00	82, 18 0.93 (0.46-1.92)	59, 41 2.96*† (1.56-5.63)	P=0.002
Usual activity no problems, problems (%) Odds ratios (95% confidence intervals)	63, 37 1.00	62, 38 1.04 (0.59-1.85)	17, 83 8.31*† (4.28-16.15)	P<0.001
Pain/discomfort no problems, problems (%) Odds ratios (95% confidence intervals)	26, 74 1.00	13, 87 2.35* (1.12-4.91)	9, 91 3.55* (1.56-8.07)	P=0.003
Anxiety/depression no problems, problems (%) Odds ratios (95% confidence intervals)	36, 64 1.00	27, 73 1.52 (0.83-2.78)	39, 61 0.88 (0.49-1.56)	NS
Visual analogue scale	57.0 (21.0)	60.6 (20.4)	45.2 (17.4)* †	P<0.001

* significantly different from community-dwelling group without CVD
† significantly different from community-dwelling group with CVD

Borowiak & Kostka Qual Life Res 2006

	Mobility	Self-care	Usual activity	Pain/ discomfort	Anxiety/ depression	Visual analogue scale
Hospitalisation			4.22*** (1.88-9.48)		0.48* (0.26-0.90)	F=6.47*
Medications (number)			1.15* (1.02-1.31)	1.50*** (1.26-1.77)		F=8.11**
Body mass index (kg•m^{-2})	1.08** (1.02-1.14)					
MNA					0.92* (0.85-0.99)	F=8.59**
Geriatric Depression Scale	1.14*** (1.06-1.23)	1.21*** (1.09-1.33)	1.12* (1.02-1.24)	1.13* (1.01-1.26)	1.36*** (1.22-1.51)	F=71.6***
MMSE						F=7.91**
ADL	0.61* (0.38-0.98)	0.24*** (0.14-0.42)	0.35** (0.16-0.74)		0.51* (0.29-0.92)	
IADL	0.83** (0.72-0.95)		0.81* (0.66-0.99)			
Stanford Moderate Index		0.47*** (0.32-0.70)	0.65** (0.49-0.85)	0.66*** (0.52-0.84)		F=6.00*

For Euoroqol dimensions, values are expressed as odds ratios (95% confidence intervals).
* p<0.05, ** p<0.01, *** p<0.001.

Borowiak & Kostka Qual Life Res 2006

These findings suggest that physical and cognitive function as well as regular PA may affect QOL more in community-dwelling elderly than the presence of CVD or even need of hospitalisation.

Borowiak & Kostka Qual Life Res 2006

Conclusions

1. Screening for CVD in the elderly – usually CVD is already there.
2. Several CVD risk factors are usually existing.
3. Prevention should be integrated with treatment.
4. Overall health approach is needed.

Thank you