Using a Cumulative Low-density Lipoprotein Cholesterol Modelling Approach to Estimate the Reduction of Risk of Atherosclerotic Cardiovascular Events from a Primary Prevention Programme

Abstract EE153

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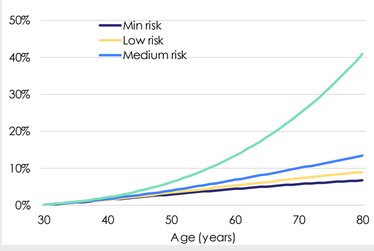
INTRODUCTION

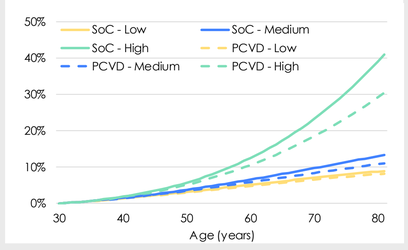
- An economic model was developed to evaluate the long-term clinical and economic outcomes of a prevention program (PP) in Estonia which aims to reduce LDL-C at the population level
- To be aligned with recent management recommendations from the World Heart Federation[1], the risk of atherosclerotic cardiovascular disease (ASCVD) was modelled according to cumulative exposure to low-density lipoprotein cholesterol (LDL-C)
- The causal role of LDL-C in the development of ASCVD has been demonstrated by genetic, observational, and interventional studies[1-3]
- Prolonged lower LDL-C is associated with lower risk of ASCVD and the results of RCTs indicate that lowering LDL-C safely reduces CVD risk even at low LDL-C levels[1-3]

OBJECTIVES

1. Estimate **the baseline incidence** of ASCVD events in **four LDL-based risk** groups in Estonia.



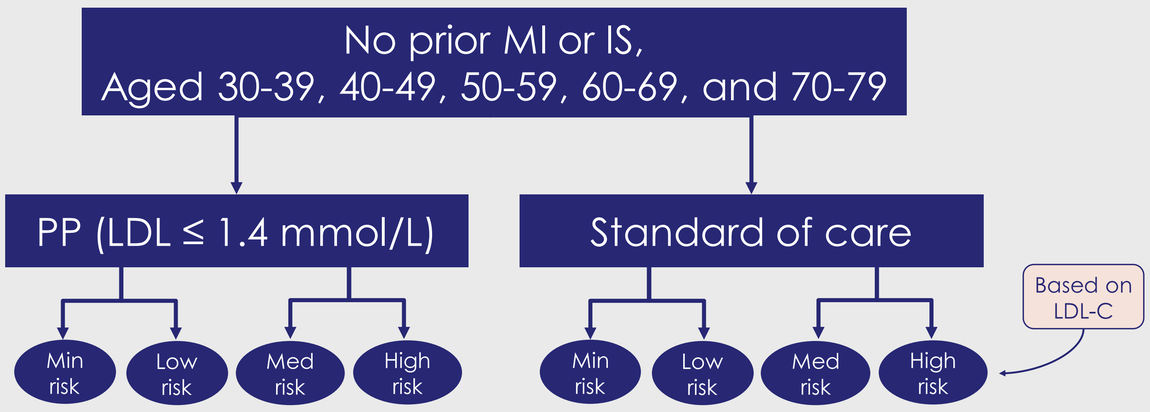
2. Estimate the **effect on ASCVD** of **reducing LDL-C** to ESC recommended target (≤1.4mmol/L)



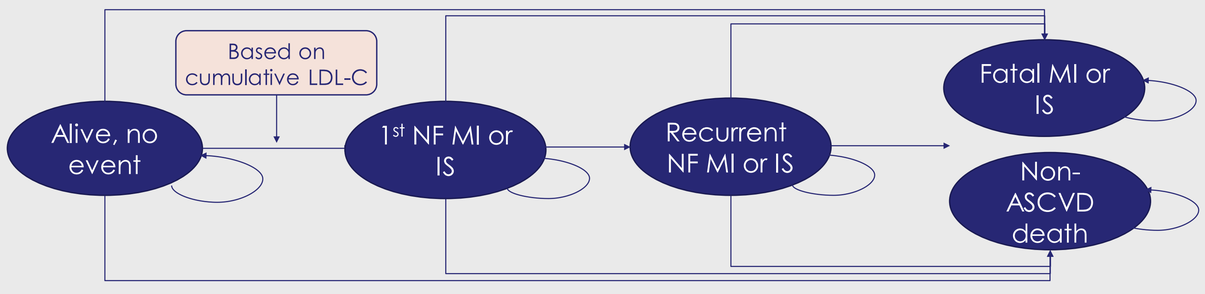
3. Estimate the incremental **costs, quality of life, and life-years** for baseline and PP.

METHODS

- A **Markov cohort model** was developed to estimate the incidence and costs of fatal and non-fatal MI and IS among cohorts aged 30- 39, 40-49, 50-59, 60-69, and 70-79 years. We **compared the standard of care (SoC) to a PP** which results in all individuals achieving a guideline recommended LDL-C target of ≤1.4 mmol/L.



- Baseline LDL-C was derived from a representative Estonian survey[4] and individuals were **categorized into four risk groups using LDL-C** target recommendations by the European Society of Cardiology.[2]
- Incidence **of first ever MI and IS** event under SoC were derived from Global Burden of Disease[5] and published studies from Estonia[4] and Finland[6].



- The **rate ratio of ASCVD events** for the PP arm considered the **cumulative LDL-C** difference vs. SoC, based on Ference et al. 2018.[3]
- Individuals were **modelled until 100 years of age**. ASCVD management costs were based on Estonian Health Insurance Fund records[7] and **discounted at 5% annually,** as per historic HTA appraisals.[7]

RESULTS

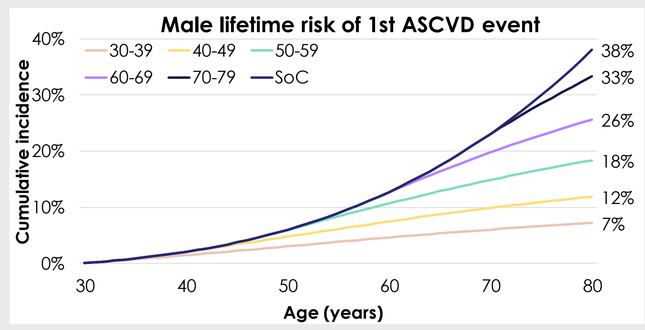
Sustained, population-wide reduction of LDL-C to target (≤1.4 mmol/L) is estimated to result in the following:

- **Proportional reduction** of lifetime incidence of ASCVD events by **70%**
- **Absolute reduction** of first ASCVD events from **27% to 8%** after 50 years
- Proportional reduction in undiscounted and discounted costs for managing ASCV events of **66%** and **51%,** respectively

Cohort	Achievement of LDL-C target (≤1.4 mmol/L)		
	Avoided events per 1,000 individuals (% reduction)	Undiscounted avoided costs per 1,000 (% reduction)	Discounted* avoided costs per 1,000 (% reduction)
30-39yo	251 (82%)	1,729,735 € (77%)	281,256€ (65%)
40-49yo	223 (77%)	1,522,815 € (71%)	349,111€ (59%)
50-59yo	196 (70%)	1,264,154 € (64%)	395,263€ (53%)
60-69yo	140 (58%)	828,855 € (54%)	339,027€ (46%)
70-79yo	94 (46%)	504,978 € (43%)	265,131€ (37%)
All ages	**188 (70%)**	**1,234,708 € (66%)**	**323,757€ (51%)**

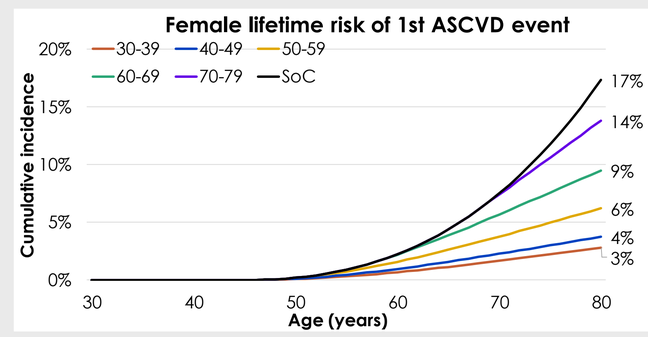
Baseline lifetime risk of 1st ASCVD event in males is 38%:

- Reducing LDL-C to target from age 30 may reduce lifetime incidence by **82%, to 7%**



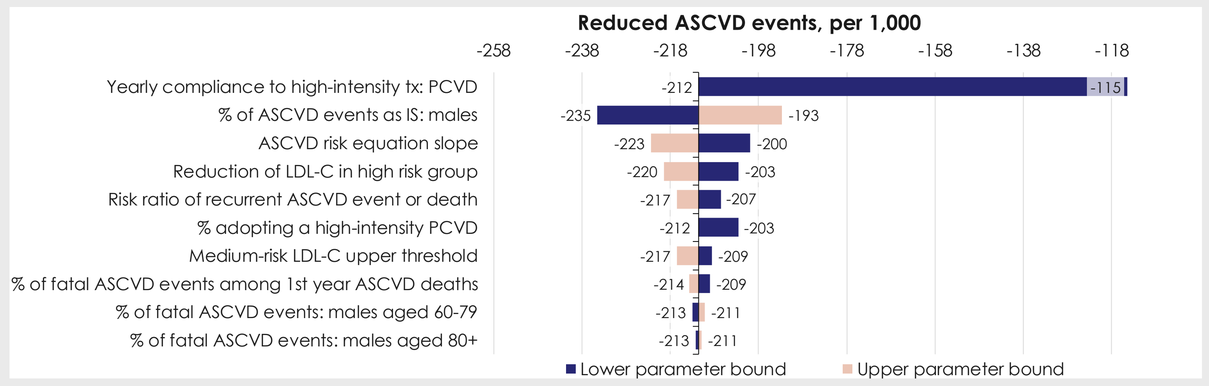
Baseline lifetime risk of 1st ASCVD event in females is 17%:

- Reducing LDL-C to target from age 30 may reduce lifetime incidence by **84%, to 3%**



One-way sensitivity analysis highlighted:

- Adherence to the prevention program was the largest driver
- Baseline ASCVD incidence and risk equation parameters were also drivers



CONCLUSIONS

- Reducing LDL-C to target levels in **younger populations** may substantially **reduce 1st ASCVD event incidence** and corresponding management costs
- The **effectiveness** of a prevention program is dependent on its **adherence**, and should be designed accordingly
- The cumulative LDL-C modelling approach is **clinically intuitive** and modelled **risk reductions are corroborated** by primary prevention outcomes in Finland observed over 40 years.
- The **cumulative LDL-C risk equation** and model parameters are subject to **ongoing refinement but** should be considered in CVD models with lifetime horizons.

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Disclosures

Max Clayson and Aline Gauthier are employees of Amaris Consulting, which received professional fees from Novartis Inc. for the study and have also received fees for projects outside the present study. Margus Viigimaa and Mark Sculpher are independently contracted and have received professional fees from Novartis Inc. for the study.

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