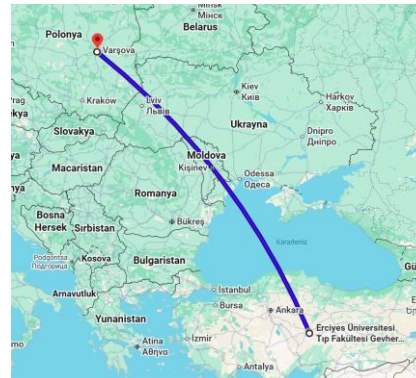


ApoBcomp: An R Shiny Framework for Apolipoprotein B Estimation and Cardiovascular Risk Modeling

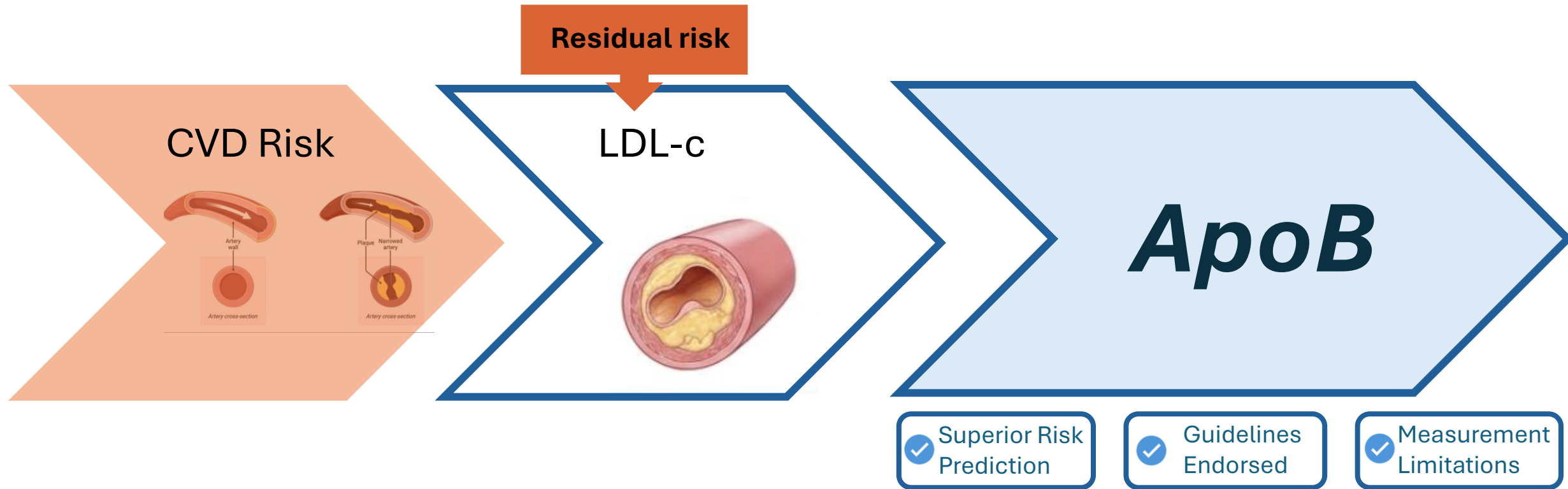
Gökmen Zararsız, Serra İlayda Yerlitaş Taştan, ***Aleyna Erakcaoglu***, Nida Sofu, Gözde Ertürk Zararsız, Ahu Cephe, Necla Kochan, Serkan Bolat, Halef Okan Doğan, Federica Fogacci, Arrigo Francesco Guiseppe Cicero

7 July, 2026

Precision Medicine and Advanced Analytics Research Group



- Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality worldwide.



No integrated framework for estimation and interpretation.

ApoBcomp [About](#) [Data Upload](#) [Estimate](#) [Manual](#)

ApoBcomp

An interactive and comprehensive web-based tool that designed to estimate Apolipoprotein B (ApoB) levels and performs cardiovascular risk assessment.

Apolipoprotein B (ApoB)

ApoB is an important marker that indicates the number of harmful lipoproteins carrying cholesterol. Also, it is a strong indicator to assess cardiovascular risk, guide lipid-lowering therapy, and monitor long-term outcomes.

Why ApoBcomp Was Developed?

ApoBcomp provides fast and reliable ApoB estimations to help clinicians, healthcare professionals and researchers for better decision-making and research.

Advanced Methodology

- ✓ **Dual Usage Mode:** Single patient data entry & Batch data upload options
- ✓ **Comprehensive Analysis:** 17 Equation Methods & 11 Machine Learning Models
- ✓ **Dual Output:** ApoB Levels Estimation & Cardiovascular Risk Score
- ✓ **Instant Results:** Immediate Estimation and Risk Assessment

Comprehensive Risk Assessment

Our estimation system is based on recommendations from two internationally accepted guidelines:

- ✓ 2019 ESC/EAS Dyslipidemia Guidelines
- ✓ 2017 AACE/ACE Lipid and Atherosclerosis Guidelines

Our model selection and validation process have been conducted in accordance with the scientific standards of these guidelines.

Technical Excellence & Reliability

The application offers an easy-to-use interface with sections for data input, method selection, and downloadable reports. Real-time server-side calculations are powered by R with ShinyProxy, OpenOnDemand, and Redis supporting multi-user sessions. Stability and reproducibility are ensured through shinytest and unit testing.

Privacy and Security

Your privacy and data security are fully protected. All data is processed locally, never stored or shared, giving you a safe and confidential ApoBcomp assessment.

Contact & Feedback

Your cardiovascular health is our priority, and we are committed to supporting informed decisions with advanced tools.

Inputs

ApoBcomp About Data Upload

Input data

- ☐ Upload a file
☒ Data entry

Unit: mg/dL

Total Cholesterol

200

Triglycerides

56

High-Density Lipoprotein Cholesterol

30

Non-High-Density Lipoprotein Cholesterol

100

Low-Density Lipoprotein Cholesterol

130

Next

Engine

ApoBcomp About Data Upload Estimate Ma

Machine Learning Methods

Gradient Boosting (GBM)
kNN
SVR (RBF kernel)
Elastic-net Regression
Lasso Regression
Linear Regression
MARS
BDNN

select more than one equation method.

Number of Decimal

3

Estimate

ApoB Result

10 Supervised ML Algorithms

Machine Learning Methods

These Machine Learning methods are listed for completeness. You can select more than one Machine Learning method.

ApoB Equation Methods

Hwang Model 1
Hwang Model 2
Dorairaj Model 1
Dorairaj Model 2
Dorairaj Model 3
Dorairaj Model 4
Dorairaj Model 5
Dorairaj Model 6

17 Established Equations

Outputs



Real-time computation & reproducible reporting

Result:

112.86

Your estimated ApoB value is 112.86.
For detailed calculation, please use the detailed interpretation button below.

2019 EAS/ESC, mg/dL	Interpretation
<65	Very High
65-79	High
80-89	Moderate
90	Low
From 2019 EAS/ESC Guidelines.	
2017 AACE/ACE, mg/dL	Interpretation
<70	Very High
70-79	High
80-89	Moderate
90	Low
From 2017 AACE/ACE Lipid Guidelines.	

*Risk factors include diabetes, cigarette smoking, HTN (BP 140/90 mm Hg or on antihypertensive medication), low HDL cholesterol (<40 mg/dL (1.03 mmol/L)), and family history of premature CAD (CAD in male first-degree relative, or father <55 years, or female first-degree relative or mother <65 years).

Select Guidelines

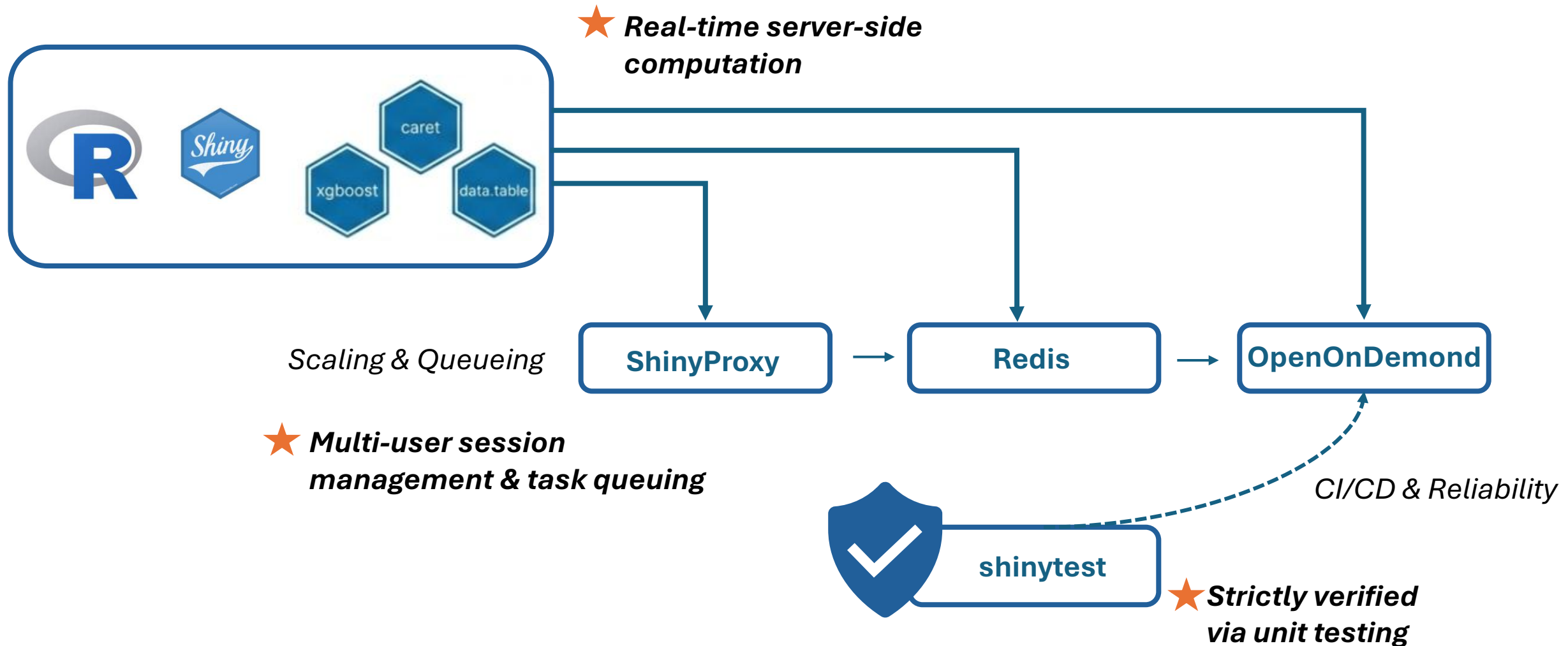
2019 EAS/ESC

2017 AACE/ACE

Detailed Interpretation

Guideline-aligned clinical risk categories for actionable insights

Validation: Grid-search optimization, repeated CV, external validation



Guideline-aligned clinical risk categories for actionable insights

Result: 88.051

Your estimated ApoB value is 88.051.
For detailed calculation, please use the detailed interpretation button below.

2019 EAS/ESC, mg/dL Interpretation

<65	Very High
65-79	High
80-89	Moderate
90	Low

From 2019 EAS/ESC Guidelines.

2017 AACE/ACE, mg/dL Interpretation

<70	Very High
70-79	High
80-89	Moderate
90	Low

From 2017 AACE/ACE lipid Guidelines.

*Risk factors include diabetes, cigarette smoking, HTN (BP 140/90 mm Hg or on antihypertensive medication), low HDL cholesterol (<40 mg/dL (1.03 mmol/L)), and family history of premature CAD (CAD in male first-degree relative, or father <55 years, or female first-degree relative or mother <65 years).

Select Guidelines

2019 EAS/ESC

2017 AACE/ACE

Detailed Interpretation

Primary Prevention

Your cardiovascular risk score is 11%.

Lifestyle intervention and concomitant drug intervention

Since your interpretation score is higher than 10. Your cardiovascular risk category: Very-high-risk

Very-high/Extreme-risk: An ApoB goal of <65 mg/dL (ESC) or <70 mg/dL (AACE) is recommended.

From 2019 EAS/ESC Guideline

CLINICAL RISK CATEGORIES	LEVEL OF EVIDENCE
Very High Risk	Level A
1. Patients with established atherosclerotic cardiovascular disease (ASCVD) who are at high risk of recurrent events.	1. High-quality evidence of benefit from treatment.
2. Patients with established ASCVD who are at high risk of recurrent events.	2. Moderate-quality evidence of benefit from treatment.
3. Patients with established ASCVD who are at high risk of recurrent events.	3. Low-quality evidence of benefit from treatment.
High Risk	Level B
1. Patients with established ASCVD who are at moderate risk of recurrent events.	1. High-quality evidence of benefit from treatment.
2. Patients with established ASCVD who are at moderate risk of recurrent events.	2. Moderate-quality evidence of benefit from treatment.
3. Patients with established ASCVD who are at moderate risk of recurrent events.	3. Low-quality evidence of benefit from treatment.
Moderate Risk	Level C
1. Patients with established ASCVD who are at low risk of recurrent events.	1. High-quality evidence of benefit from treatment.
2. Patients with established ASCVD who are at low risk of recurrent events.	2. Moderate-quality evidence of benefit from treatment.
3. Patients with established ASCVD who are at low risk of recurrent events.	3. Low-quality evidence of benefit from treatment.
Low Risk	Level D
1. Patients with established ASCVD who are at very low risk of recurrent events.	1. High-quality evidence of benefit from treatment.
2. Patients with established ASCVD who are at very low risk of recurrent events.	2. Moderate-quality evidence of benefit from treatment.
3. Patients with established ASCVD who are at very low risk of recurrent events.	3. Low-quality evidence of benefit from treatment.

Guideline	Very High Risk	High Risk	Moderate Risk	Low Risk
2019 EAS/ESC	Very High Risk	High Risk	Moderate Risk	Low Risk
2017 AACE/ACE	Very High Risk	High Risk	Moderate Risk	Low Risk



<https://biotools.erciyes.edu.tr/ApoBcomp/>

➤ Data-Driven Clinical Decisions

- Boekholdt, S. M., Arsenault, B. J., Mora, S., Pedersen, T. R., LaRosa, J. C., Nestel, P. J., Simes, R. J., Durrington, P., Hitman, G. A., Welch, K., et al. (2012). Association of ldl cholesterol, non-hdl cholesterol, and apolipoprotein b levels with risk of cardiovascular events among patients treated with statins: a meta-analysis. *Jama*, 307(12):1302–1309.
- Carroll, M. D., Mussolino, M. E., Wolz, M., and Srinivas, P. R. (2018). Trends in apolipoprotein b, non-high-density lipoprotein, and low-density lipoprotein for adults 60 years and older by use of lipid-lowering medications: United states, 2005 to 2006 through 2013 to 2014. *Circulation*, 138(2):208–210.
- Cho, D.-S., Woo, S., Kim, S., Byrne, C. D., Kong, J.-H., and Sung, K.-C. (2012). Estimation of plasma apolipoprotein b concentration using routinely measured lipid biochemical tests in apparently healthy asian adults. *Cardiovascular Diabetology*, 11(1):55.
- Cicero, A. F., Fogacci, F., Giovannini, M., Rizzoli, E., Grandi, E., D’Addato, S., and Borghi, C. (2023). The effect of dietary supplementation with plant sterols on total and ldl-cholesterol in plasma is affected by adherence to mediterranean diet: insights from the desco randomized clinical study. *Nutrients*, 15(21):4555.
- De Oliveira-Gomes, D., Joshi, P. H., Peterson, E. D., Rohatgi, A., Khera, A., and Navar, A. M. (2024). Apolipoprotein b: bridging the gap between evidence and clinical practice. *Circulation*, 150(1):62–79.
- Dorairaj, P., Manickam, S., Raju, S., and Chandrasekhar, A. (2023). An android app “apolipoprotein b calculator” calculates apolipoprotein b using regression analysis and neural network—using the friedewald equation is the same as directly measured low-density lipoprotein cholesterol and better at low-density lipoprotein levels. *Journal of Indian College of Cardiology*, 13(2):69–75.

- Grundy, S. M. (2019). Aha/acc/aacvpr/aapa/abc/acpm/ada/ags/apha/aspc/nla/pcna guideline on the management of blood cholesterol: a report of the american college of cardiology/american heart association task force on clinical practice guidelines. *Circulation*, 139(25):e1082.
- Hermans, M. P., Sacks, F. M., Ahn, S. A., and Rousseau, M. F. (2011). Non-hdl-cholesterol as valid surrogate to apolipoprotein b100 measurement in diabetes: Discriminant ratio and unbiased equivalence. *Cardiovascular diabetology*, 10(1):20.
- Hwang, Y.-C., Ahn, H.-Y., Lee, W. J., Park, C.-Y., and Park, S.-W. (2012). An equation to estimate the concentration of serum apolipoprotein b. *PLoS One*, 7(12):e51607.
- Johannesen, C. D. L., Mortensen, M. B., Langsted, A., and Nordestgaard, B. G. (2021). Apolipoprotein b and non-hdl cholesterol better reflect residual risk than ldl cholesterol in statin-treated patients. *Journal of the American College of Cardiology*, 77(11):1439–1450.
- Kathiresan, S., Otvos, J. D., Sullivan, L. M., Keyes, M. J., Schaefer, E. J., Wilson, P. W., D'Agostino, R. B., Vasan, R. S., and Robins, S. J. (2006). Increased small low-density lipoprotein particle number: a prominent feature of the metabolic syndrome in the framingham heart study. *Circulation*, 113(1):20–29.
- Khan, S. U., Khan, M. U., Valavoor, S., Khan, M. S., Okunrintemi, V., Mamas, M. A., Leucker, T. M., Blaha, M. J., and Michos, E. D. (2020). Association of lowering apolipoprotein b with cardiovascular outcomes across various lipid-lowering therapies: systematic review and meta-analysis of trials. *European journal of preventive cardiology*, 27(12):1255–1268.