Opponent's statement regarding doctoral candidate Eero Poukka's dissertation at the University of Helsinki

My name is Preben Aavitsland. I am a medical doctor, epidemiologist, and professor at the Pandemic Centre, University of Bergen, Norway, and Acting Director of Infectious Disease Prevention and Control at the Norwegian Institute of Public Health.

I acted as opponent in the public examination held on 13 December 2025 of Eero Poukka's doctoral dissertation entitled *"COVID-19 vaccine effectiveness in Finland during the pandemic."* This statement is based on a thorough review of the doctoral thesis, the five published articles on which it is based, the reports of the two preliminary reviewers, and the public examination.

General Overview

The candidate sets out a clear and well-defined objective: *"The objective of this thesis was to evaluate the effectiveness of COVID-19 vaccines across different phases of the pandemic and various demographic groups to support evidence-based policy decisions in Finland."* The thesis represents an excellent example of applied research, namely the use of scientific knowledge to address practical, real-world problems by answering specific, actionable questions with direct implications for public health policy.

The research originates from the Finnish Institute for Health and Welfare (THL). The thesis is based on five published articles reporting epidemiological studies that estimate the effectiveness of COVID-19 vaccination in different population groups—older adults, healthcare workers, and adolescents—against various outcomes (see Table). All studies are based on linkage of data from several of Finland's national health registers.

The research was conducted rapidly under exceptionally challenging conditions. Finland, like other countries, was confronted with a real pandemic with the potential for substantial disease burden and major disruption of healthcare services and society. The pandemic was caused by a novel virus against which the population had little or no pre-existing immunity. New vaccine technologies were deployed, and vaccines were rapidly developed, evaluated in randomized trials, authorized, produced, and rolled out. There was an urgent need for high-quality observational studies to guide the vaccination programme so that it could be continuously refined and implemented in the most effective manner to save lives.

Study	Time	Exposure	Outcomes	Comparison	Results, VE
The elderly (cohort)					
I	Dec 2020 – May 2021	Dose I, II	Infection Hospitalisation	No doses	Inf: ≈ 50 % with 1 dose, 75 % with 2 Hosp: ≈ 60 % with 1 dose, 93 % with 2
IV	Dec 2020 – Mar 2022	Dose, I, II, III	Hospitalisation ICU admission	No doses	Hosp: > 90 % with 2 doses, but waning ICU: > 90 % with 2 doses, but waning
V	Sep 2022 – Aug 2023	Bivalent booster	Hospitalisation Death	II+ doses	Hosp: ≈ 50 % «VE» Death: ≈ 60 % «VE»
Health care workers (cohort)					
II	Dec 2020 – aug 2021 / Oct 2021	Dose I, II	Infection Hospitalisation	No doses	Inf: > 80 %, but waning Hosp: ≈ 90 % with 2 doses
Adolescents (target trial)					
III	May 2021 – Apr 2023	Dose I, II	Infection Hospitalisation	No doses	Inf: < 20 % Hosp: ≈ 80 %

The Summary of the Doctoral Thesis

The summary of the doctoral thesis comprises 78 pages and includes 287 references, as well as several explanatory tables, figures, and graphics. It contains a comprehensive literature review, a clear statement of aims, a detailed description of methods, a summary of results, and well-developed discussion and conclusion sections.

The candidate demonstrates a very good understanding of vaccine epidemiology, including the strengths and limitations of various observational study designs. He cites many key references, and his discussion of confounding and the use of negative controls to assess residual confounding is of particularly high quality. The candidate also discusses target trial emulation, a relatively recent methodological concept. I would, however, have welcomed a more critical discussion of the lack of blinding inherent in such observational designs.

The results of the five studies are summarized clearly and effectively. The discussion and conclusions are strong. The candidate explicitly acknowledges the main challenge inherent in observational vaccine effectiveness studies, namely the potential for residual confounding. He discusses how negative control periods and outcomes can be used to better understand the magnitude of such bias. The summary also includes a thoughtful section on future prospects for vaccine effectiveness estimation.

The Published Articles

The five articles were published between 2021 and 2024 in well-regarded international journals (PLoS One, Vaccine, Pediatrics, BMC Infectious Diseases, and Eurosurveillance). They have already received a substantial number of citations. The candidate is first author on all five publications, including two with shared first authorship.

Articles I, IV, and V report studies of vaccine effectiveness among older adults at three different time points during the pandemic. The primary outcome is hospitalization. In the first two studies, unvaccinated individuals serve as the comparison group, while the

third study compares individuals who did and did not receive a bivalent booster dose. The main finding across these studies is very high and only slowly waning protection against hospitalization, whereas protection against infection is lower and wanes more rapidly.

Article II reports a study conducted among healthcare workers. Vaccine-induced protection against infection was initially very high but declined substantially over a follow-up period exceeding six months.

Article III reports a multinational study among adolescents in four Nordic countries. Vaccine effectiveness against hospitalization remained very high for up to one year, although the baseline risk of severe disease was very low in this age group.

The Public Examination

The public examination lasted two and a half hours. The candidate delivered his *lectio praecursoria*, after which I gave an opening statement, conducted a thorough examination, and concluded with a final statement.

I examined the candidate on all sections of the summary and all five articles. Particular attention was given to confounding, the use of negative control periods and outcomes, and other methodological and design-related issues. The candidate responded well to the questions and engaged in advanced and nuanced discussion of vaccine epidemiology. He demonstrated clear mastery of the material and a profound understanding of both the specific issues addressed in the thesis and the broader methodological challenges in the field.

Conclusion

I conclude that the dissertation should be graded “pass.” The thesis has high scholarly value, and the candidate has demonstrated a thorough understanding of the subject matter of the dissertation, as well as of vaccine epidemiology more generally.

Signature

Signed in Kristiansand, Norway on 18 December 2025,

Preben Aavitsland