

Viña del Mar, May 4, 2022

Dear Mr. van de Wiel, dear members of the BAZIS jury,

Without the opportunity to meet you in person, I would like to express my thanks for the BAZIS prize by this letter. (And apologies for the delay! The award caught me in the middle of a transcontinental house-moving.)

I am delighted that some contributions from my thesis are still considered relevant. My research was carried out in the context of post-marketing vaccine safety studies – a few years before Covid – and some results are still being applied in current research. In fact, I continue developing the resulting software thanks to support from the Vac4EU collaboration.

But while working on my PhD I was struck by the responsibility that lays on software in the implementation of post-marketing vaccine studies and, consequently, in the decision making around it. This became even stronger through the giant vaccination programs of the past years. Responsibility laying on software that is written by humans and may in many, surprising ways not work as intended: programming errors! misconceptions! runtime errors! Most commonly, we try to detect incorrect program behaviour through tests, i.e., by running the program on some input where the output is known. But as E. W. Dijkstra put it succinctly: “Program testing can be used to show the presence of bugs, but never to show their absence!” (Which shouldn’t come as a surprise when familiar with the scientific method.)

To show the absence of errors in a program requires a different approach, namely formal software verification. Here, the intended properties of the program behaviour and the program itself are translated into an abstract, logical model, and a logical correspondence between the two proves that the program exhibits the intended behaviour. Always and forever, just as truth in logic. This became eventually the topic of my postdoc, and while totally unrelated to my PhD it was still a direct reaction. Admittedly, formal software verification is a heck of a lot of work (and full of research opportunities!), but it is the only way to gain certainty about the correctness of a program. That is why it is commonly used only in high-risk domains or when software is mission-critical. But in my opinion, considering how pharmaco-epidemiological research – especially about vaccines – affects the health of large parts of the population, the underlying software would likewise deserve guaranteed correctness.

Thank you very much for the BAZIS-prijis 2020!  
Benedikt Becker