

Citation

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Intervention effectiveness is not yet an indication

>> The argument in favour of the use of vaccines to prevent 'severe courses' of Covid-19 infections was often based on the argument of high efficacy of 90% or more. This figure is a relative risk reduction RRR, which is the correct and therefore common measure for assessing the effectiveness of a medical intervention. Critics of vaccination, on the other hand, doubt the general protective effect, pointing to the low values for the absolute risk reduction ARR, which is 1% or less in relation to the entire population studied.

The different measures have led to some confusion and controversy, so that the fact checkers have also come onto the scene. For example, the Reuters Fact Check (1) explains the difference between RRR and ARR in a somewhat Solomonic and at the same time meaningless way: 'they are both capturing some aspect of reality, just measuring it in a different way', followed by the sweeping assertion on relative risk reduction: 'It is more meaningful'. However, the benefit of the ARR remains unexplained in the fact check and its statement is ultimately judged as 'misleading' in the verdict.

However, the situation is not that simple, because the statement of the ARR value is the decisive criterion in practice, i.e. the application of a measure judged to be sufficiently effective to specific population groups - because the RRR often says little or nothing about the real-world benefit of the intervention for a specific risk group (2). The wording of the description must be taken carefully: The RRR makes a statement about the intervention itself, i.e. the vaccine and its performance in preventing adverse events, but not about where this performance leads to sufficient benefit, i.e. where the intervention is indicated. Both from an individual perspective ('How much risk reduction does the intervention bring me?') and from a societal perspective (in public health and healthcare: reduction of disease or death), the effectiveness of an intervention is a prerequisite, but not a sufficient criterion, because ultimately it is about the achievable effect. This consists of the extent of the absolute (!) reduction in the risk of illness or death that a person or a population group experiences as a result of the intervention: This is precisely the benefit for the respective person or population. However, the ARR as a measure of benefit is now situation-dependent, i.e. dependent on the respective baseline risk R0 of the person or group:

$$ARR = R0 - R1 = R0 * RRR.$$

The ARR may not be generalised from one study population to other populations without further ado, as is possible with certain limitations with the RRR. It is not simply a characteristic of the vaccine alone, but also of the basic risk R0.

To illustrate this, here is an example of the role of the application situation (with fictitious figures): If we consider the problem of increased risk of mortality for pedestrians due to falling roof tiles on pavements, the intervention to be considered would be to make it compulsory for pedestrians to wear safety helmets. The justification could be that safety helmets are highly effective in protecting pedestrians. A reduction in the risk of mortality can be expected with an RRR of around 95%. This would justify an objection to a general helmet requirement for pedestrians. A sufficient benefit only exists if there is a sufficiently high ARR compared to everyday risks. The absolute risk of falling roof tiles is very low, so that even a 95% reduction in the risk of death compared to other everyday risks would not justify the measure, even though it is highly effective and inexpensive. This probably corresponds to the assessment of most pedestrians, who intuitively feel that wearing a safety helmet makes little sense. In the case of mass interventions, a clear distinction must therefore be made between risk groups and (de facto) non-risk groups. Even a highly effective intervention (i.e. RRR towards 100%) only makes sense for those groups in which there is a medically relevant basic risk and in which a relevant absolute risk reduction can therefore be achieved at all. The small overall ARR values of often well below 1% in the Covid-19 vaccine studies reflect precisely this fact: for a considerable proportion of the study population, the benefit was apparently extremely small, even if the vaccines were highly effective - just as a helmet for pedestrians would be.

The situation is different for populations without non-risk groups, i.e. when every person benefits from a risk reduction. A typical example is compulsory seat belts in motor vehicles. Even if not all occupants have the same risk depending on their state of health, seating position and the design of the vehicle, all persons without a seatbelt have a non-negligible increased risk of mortality and morbidity. There is no de facto non-risk group among the occupants that would not benefit from the measure, which is why a mandatory protective measure for all is sensible and understandable. In contrast, a non-sterilising vaccination of a non-risk group has neither a direct effect (as an intrinsic benefit for this group) nor a relevant indirect effect (as an external benefit due to the containment effects on the spread of infection). <<

Literature:
1: Reuters Fact Check: Why Relative Risk Reduction, not Absolute Risk Reduction, is most often used in calculating vaccine efficacy. (https://www.reuters.com/article/idUSL2N2NK1XA/)
2: Stronegger, W. Vernachlässigte Differenzierungen: Von relativer und absoluter Risikoreduktion und von Sicherheitsgurten und Impfstoffen. Dtsch Med Wochenschr 2023; 148(04): 192-197