

Revisiting Attributable Risk and Population Attributable Risk: A Clarification of Concepts

Yogeswaran Nehru S¹

¹School of Public Health, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry, India

DOI: 10.55489/njcm.170320266199

Keywords: Epidemiological Measures, Attributable Risk, Population Attributable Risk, Public Health Impact

ARTICLE INFO

Financial Support: None declared

Conflict of Interest: The authors have declared that no conflict of interest exists.

Received: 29-11-2025, **Accepted:** 24-01-2026, **Published:** 01-03-2026

Correspondence: Dr. Yogeswaran Nehru S (Email: ssjyogesh05@gmail.com)

Sir,

The concepts of Relative Risk (RR), Attributable Risk (AR), and Population Attributable Risk (PAR) are basic to understanding causation and disease prevention in epidemiology. Relative Risk quantifies the strength of association between exposure and disease, whereas PAR provides insight into the actual burden of disease attributable to an exposure.¹⁻³ Despite being authoritative references, including Park's Textbook of Preventive and Social Medicine and the IAPSM Textbook of Community Medicine, many epidemiology textbooks lack a clear, step-by-step derivation of total population incidence (Ip) when introducing attributable risk measures. In addition, several texts do not clearly distinguish absolute measures, such as attributable risk (AR) and population attributable risk (PAR), from their relative measures (AR% and PAR%). These gaps make it difficult for students to understand how population-level measures are derived from incidences observed in different subgroups and may lead to conceptual misunderstanding and inappropriate interpretation in public health contexts.^{4,5} Therefore, understanding about AR and PAR is crucial for translating epidemiological observations into public health action.

UNDERSTANDING THE NEED BEYOND RELATIVE RISK

Attributable Risk (AR) and Population Attributable Risk (PAR) are used to estimate the excess risk due to exposure among the exposed population (AR) and in the total population (PAR) beyond the strength of association found by Relative Risk (RR).³⁻⁵ Moreover, the interpretation of AR and PAR relies on several key assumptions. First, the exposure must have a causal relationship with the outcome. Second, major confounding should be absent or adequately controlled. Third, the disease occurrence in the unexposed group represents the baseline risk of the disease. Finally, AR and PAR are incidence-based measures and therefore require a clearly defined population at risk over a specified time period.^{2,3} These measures ultimately guide but are not limited to public health prioritization, resource allocation, intervention design, program evaluation, risk communication, and policy formulation.²

CONCEPTUAL CLARIFICATIONS AND STEPWISE FORMULAS

Relative Risk (RR): This is the measure of associa-

How to cite this article: Nehru SY. Revisiting Attributable Risk and Population Attributable Risk: A Clarification of Concepts. Natl J Community Med 2026;17(3):242-243. DOI: 10.55489/njcm.170320266199

Copy Right: The Authors retain the copyrights of this article, with first publication rights granted to Medsci Publications.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Share Alike (CC BY-SA) 4.0 License, which allows others to remix, adapt, and build upon the work commercially, as long as appropriate credit is given, and the new creations are licensed under the identical terms.

www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

tion to quantify the relationship between exposure and disease.^{1,4,5}

Formula: $RR = I_e / I_u$

Where, I_e is Incidence among Exposed
 I_u is Incidence among Unexposed

Interpretation:

$RR > 1$ indicates an increased risk of disease among the exposed.

$RR < 1$ indicates a decreased risk of disease among the exposed.

Attributable Risk (AR), also known as risk difference, quantifies the absolute excess risk among the exposed attributable to the exposure.²

Formula: $AR = I_e - I_u$

Interpretation: Represents the incidence of disease among exposed individuals that can be attributed to the exposure.

Attributable Risk Percent (AR%), also known as attributable proportion, indicates the proportion of disease among the exposed that is due to the exposure.^{2,4,5} Moreover, this proportion assumes that the disease occurrence in the unexposed group is the

baseline risk for that disease.² Overall, it represents the expected reduction in disease if the exposure could be removed.²

Formula: $AR\% = \frac{I_e - I_u}{I_e} \times 100$

Population Attributable Risk (PAR) represents the excess incidence in the total population attributable to the exposure.³

Formula: $PAR = I_P - I_u$

Where I_P is the incidence of disease in the total population, calculated by using this formula

$I_P = P_e \times I_e + (1 - P_e) \times I_u$

P_e is the prevalence of exposure to the risk factor in the total population.

Population Attributable Risk Percent (PAR%) indicates the proportion of total disease in the population (exposed and unexposed) attributable to the exposure.³ Similar to attributable risk percent, PAR% assumes the baseline risk as incidence in the unexposed group.

Formula: $PAR\% = \frac{I_P - I_u}{I_P} \times 100$

Illustrative Example:

Consider a cohort study where:

$I_e = 50$ per 1000 person-years (0.050); $I_u = 10$ per 1000 person-years (0.010); $P_e = 30\%$ (0.30)

Stepwise calculation:

$RR = 0.050 / 0.010 = 5.0$

$AR = 0.050 - 0.010 = 0.040$ (40 per 1000 person-years)

$AR\% = (0.040 / 0.050) \times 100 = 80\%$

$I_P = (0.30 \times 0.050) + (0.70 \times 0.010) = 0.022$

$PAR = 0.022 - 0.010 = 0.012$ (12 per 1000 person-years)

$PAR\% = (0.012 / 0.022) \times 100 = 54.5\%$

Interpretation: 80% of disease among the exposed and approximately 55% of disease in the total population are attributable to the exposure.

Overall, clearer pedagogy is needed in the presentation of attributable risk measures. We strongly recommend that educators and textbook authors explicitly include stepwise derivations of total population incidence (I_P) and clearly separate absolute from relative measures both conceptually and mathematically. Such improvements would enhance student comprehension, reduce common misinterpretations, and promote more accurate application of epidemiologic measures in research and public health practice.

Acknowledgement: I am grateful to Sri Balaji Vidyapeeth (Deemed to be University), Pondicherry, for providing the necessary resources and support.

Declaration of Non-use of Generative AI Tools: This article was prepared without the use of generative AI tools for the content. All findings and interpretations are based solely on the authors' independent work and expertise.

REFERENCES

- Centers for Disease Control and Prevention. Principles of Epidemiology in Public Health Practice, 3rd Edition: Lesson 3 - Section 5: Measures of Association. U.S. Department of Health & Human Services; 18 May 2012.
- Centers for Disease Control and Prevention. Principles of Epidemiology in Public Health Practice, 3rd Edition: Lesson 3 - Measures of Risk; Section 6: Measures of Public Health Impact. U.S. Department of Health & Human Services; 2012 May 18.
- Kirch W, editor. Population Attributable Risk (PAR). In: Encyclopedia of Public Health. Dordrecht: Springer Netherlands; 2008. p.1117-1118. DOI: https://doi.org/10.1007/978-1-4020-5614-7_2685.
- Park K. Principles of Epidemiology and Epidemiologic Methods. In: Park's Textbook of Preventive and Social Medicine. Jabalpur: Banarsidas Bhanot; 2025. p. 60-150.
- Kadri AM. Epidemiology and Research Studies. In: IAPSM's Textbook of Community Medicine. New Delhi: Jaypee Brothers; 2024. p.166-181.