

# The Metabolic Syndrome Real or Myth

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Assumptions underlying the concept of the Metabolic Syndrome (MS) are implicit rather than explicit. Categorization of patients into have and don't have MS groups is based on five features, any combination of three or more may be used to determine which category they belong to. These features are triglyceride, glucose, and High Density (HD) cholesterol levels, blood pressure and obesity.

The number of combinations arising from five features taken three at a time is found by substituting in the following expression:

$$n!/k!(n-k)!; \text{ thus } 5!/3!(5-3)! = 120/12 = 10$$

These 10 combinations can be characterized as: ABC, BCD, BDE, CDE, BAD, CAD, CAE, DEA, ABE, BCE where Obesity=A; BP=B; HD Cholesterol=C; Triglycerides=D & Glucose=E.

If the metabolic syndrome is a coherent entity the assumption is that any of these combinations of variables will produce very similar categorizations regardless of which of the 10 combinations is used. This is largely true but the above analysis also shows that while the categorizations correctly identify about 58% of the actual cases they also incorrectly identify many others (43%) (See table 1 below). I used data from the well known U.K. Caerphilly study. This does not include glucose levels so I could use up to 4 features only. But it has the advantage of noting an outcome of Myocardial Infarct (MI) followed for over 30 years, which allows verification of the results. The discriminant function technique (SPSS v.26) was used.

False positives are those cases misclassified as associated with MI when they are not and false negatives are the misclassification as not associated with MI when, in fact, they are.

It is clear from the results that the classification, using these defining variables, of having the metabolic syndrome is less than 10% better than chance (50/50). The number of false positive selections is about three times as great as the true positives which account for only 58% of the actual positive cases. The amount of total variance accounted for by these defining variables ranges between 23% to 34%. When four definers ABCD were used together the results were only marginally better.

This weak relationship between MI and defining variables demonstrates that the metabolic syndrome is a very imperfect concept. In its present form its use is likely to give misleading conclusions.

Thanks to Professor Y. Ben-Shlomo for access to the Caerphilly data.

**Table 1:** Results of applying three groups of classifiers to data on myocardial infarcts (Of the actual 1786 cases; 348 had MI and 1438 did not have MI).

Classifiers	Groups				
	ABC	BCD	BAD	CAD	ABCD
True Positives	201 (58%)	199	199	198	203
False Positives	622	585	570	607	586
True Negatives	816 (57%)	853	868	831	852
False Negatives	147	149	149	150	145