Necessary Conditions

A necessary condition is an antecedent condition that is a superset of the outcome. Example: instances of state breakdown constitute a superset of instances of social revolution. State breakdown is considered by many scholars to be a necessary condition for social revolution.

With both crisp and fuzzy sets, the necessary condition/superset relation can be indicated using the "≥" sign, as in:

$$X_i \geq Y_i \qquad \text{(X is a superset of Y)}$$

Once the superset relation has been established, it is possible to assess whether the superset *makes sense* as a necessary condition and then whether it is a *theoretically relevant* necessary condition. For example, the set of former milk drinkers is a superset of the set of heroin users. However, drinking milk does not make sense as a necessary condition for heroine addiction. Even if a condition does make sense as a necessary condition, it still must pass the second test, theoretical relevance. An example: air to breathe is truly a necessary condition for social revolution; however, this condition is not relevant to theory.

Generally, rare outcomes (low average membership in the outcome) have one or more necessary conditions. Common outcomes (high average membership in the outcome) have multiple sufficient combinations of conditions.

Statements about necessary conditions

Logical form: X is necessary for Y, or X ≥ Y ("≥" indicates "is a superset of")

Common verbal reformulation: if no X, then no Y, or ~X ≤ ~Y ("≤" indicates
"is a subset of")

That is, instead of saying that "state breakdown is a necessary condition for social revolution," we tend to say, "no state breakdown, no social revolution." There are two reasons for this common reformulation:

(1) In English, we like to state subsets before supersets. It is the most common grammatical form for statements about set relationships.

(2) The reformulation also has the form of a counterfactual statement, which is an attractive way of thinking about and understanding necessary conditions. (By the way, the verbal reformulation is a direct implementation of De Morgan's Law.)

Perhaps the most famous example of this type of statement (a negated necessary conditions claim) is Barrington Moore's claim, "No bourgeoisie, no democracy."

Counterfactual reasoning with INUS conditions

Counterfactual statements are common in case-oriented research, as a way to point out conditions that are considered important. For example: “If not for the solidarity of the workers, the revolution would have failed.” This statement makes it appear that worker solidarity is the key ingredient (i.e., the silver bullet) for social revolution. The statement is highly deceptive, however, for two important reasons:

> (1) It appears to be monocausal, when usually it is not. The usual situation is that it was a **combination** of conditions that produced the outcome (social revolution), and the condition in question was a necessary (essential, nonredundant) part of that combination—an indispensible contributing cause. Of course, there could be other indispensible causes.
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> (2) Even more problematic is the fact that the condition in question may be a necessary part of only one of several different sufficient combinations of conditions; in short, the combination that the condition is a member of may be sufficient but not necessary.

In other words, “worker solidarity” may be just another INUS condition, when it comes to social revolution. (INUS = insufficient but necessary/nonredundant part of a combination of conditions which itself is unnecessary but sufficient for the outcome.) The bottom line is that the statement: “without x, there would be no y” can be very deceptive. It can appear to be true (and sweeping) when its actual scope may be quite narrow and circumscribed.

Some common mistakes or shortcomings associated with necessary conditions:

- failing to examine the possibility of necessary conditions altogether
- excluding a necessary condition from the truth table analysis (sometimes this is OK—see below)
- jumping to the conclusion that a condition is necessary simply because it appears in all the recipes in a given truth table solution
- failing to notice that a necessary condition has been dropped from a parsimonious solution (in general, intermediate solutions are preferred)
- compounding necessary conditions (using logical "and") without explicitly testing the necessity of their intersection

This last problem requires a little explication. Suppose we got the following results:

$A \geq Y$ consistency = 0.9

$B \geq Y$ consistency = 0.9

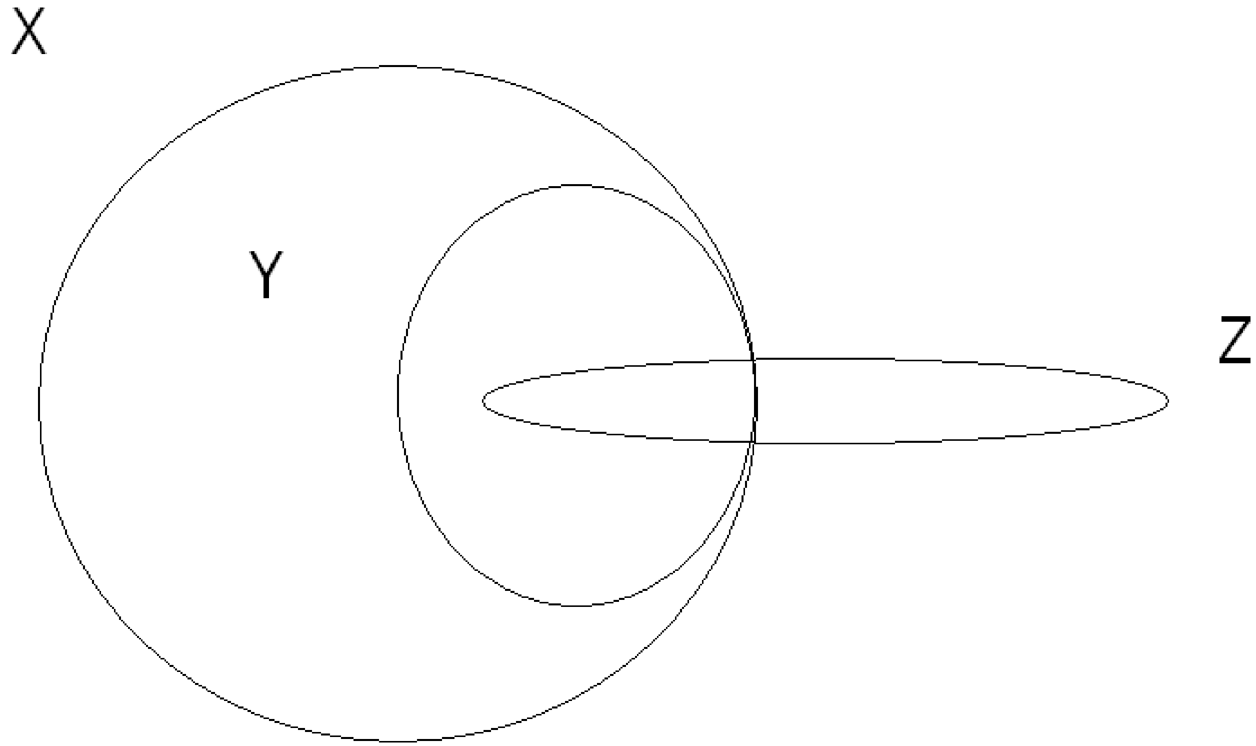
We conclude that A and B are both necessary conditions, and conclude as well that

$A \bullet B \geq Y_i$

However, the consistency of this combined formulation could be well below 0.9. Why? because A•B is the min(A,B) which means that A•B scores in general will be lower than A scores and lower than B scores. Since $A \bullet B \leq A$ and also $\leq B$, it follows that more A•B scores are at risk at being $< Y$ (and thus violating the superset relation), compared to either A scores or B scores. In short, the consistency of A•B as a superset of Y could be substantially lower than 0.9. The necessity of A•B must be tested separately from the necessity tests for A and B.

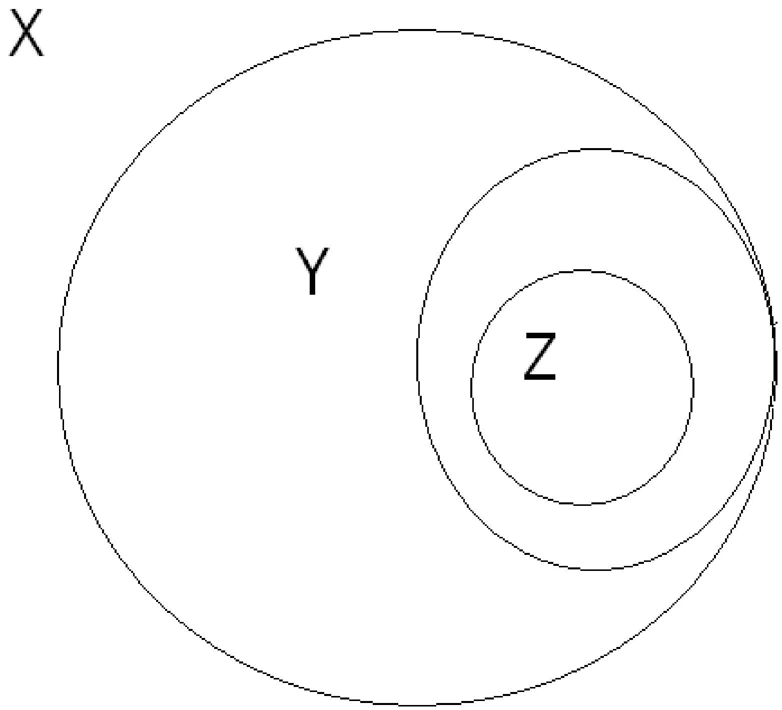
Why it is a usually a mistake to drop necessary conditions from a truth table analysis:

Truth table analysis focuses on sufficient combinations of conditions. Why, you might wonder, should necessary conditions be included in an analysis of sufficient conditions? Consider the following diagram:



X is a necessary condition for Y, a superset of the outcome. Z is another causal condition, but by itself, it is neither necessary nor sufficient for Y. However, the intersection of X and Z (X•Z) is a subset of Y and therefore could be considered sufficient for Y. If you conducted the truth table analysis without X (the necessary condition), then Z would be rejected as a sufficient condition.

It follows that a necessary condition can be left out of the truth table analysis only if relevant sufficient conditions (or sufficient combinations of conditions) are *also* subsets of the necessary condition, as in:



If Z is also a subset of X, then X has little or no influence on the calculation of the consistency of Z as a subset of Y. (In effect, all Z is X•Z.)