# Causal Analytic Methods in Sociology: A Comparison of the Simon-Blalock Method and the Methods of Durkheim's *Le Suicide*[1]

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**Causal Analytic Methods in Sociology: A Comparison of the Simon-Blalock Method and the Methods of Durkheim's *Le Suicide*.** The article analyzes the methods employed in causal reasoning in sociology, which can be viewed as analytic. As a paradigmatic example of these methods, the Simon-Blalock method is examined. First, those characteristics of a method of science that turn it into an analytic method are delineated. Then the article offers a general characteristic of methods of causal reasoning as employed in sociology and shows why they can be viewed as being analytic by their very nature. Finally, the article shows how Durkheim combined analytic methods applied to egoistic suicide with nonanalytic methods in his causal reasoning about this type of suicide.
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## Introduction

The article provides an analysis of methods employed in causal reasoning in sociology, which can be viewed as analytic. As a paradigmatic example of these methods, the Simon-Blalock method is examined. First, those characteristics of a method of science that turn it into an analytic method are delineated. Then the article offers a general characteristic of methods of causal reasoning as employed in sociology and shows why they can be viewed as being analytic by their very nature. Finally, the article shows how Durkheim combined analytic methods applied to egoistic suicide with nonanalytic methods in his causal reasoning about this type of suicide.

My aim in this article is to provide an analysis of those methods employed in causal reasoning in sociology, which can be viewed as analytic by their very nature. As a paradigmatic example of these methods I view the Simon-Blalock method. At the same time, however, because of specific features of this method, I will show that this method has to be combined with other nonanalytic methods of reasoning in order to enable reasoning about causal relations.

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I start with a delineation of those characteristics of a method of science which turn it into an analytic method. Then I provide a general characteristic of methods of causal reasoning as employed in sociology and show why they can be viewed as being analytic by their very nature. Next I provide an overview of the Simon-Blalock (S-B) method and show why this analytic method is a necessary but not sufficient component in a fully-fledged method of causal reasoning[3]. Finally, I show how Durkheim combined analytic methods applied to egoistic suicide, even if lacking advanced analytic methods like the S-B method, with other nonanalytic methods in his causal reasoning about this type of suicide.

**When is a method of science analytic?**

Standardly, a method of science is understood as analytic, if the steps it prescribes require empirical research. This, however, in turn, requires delineating the meaning of the term "empirical," an endeavor that is quite hopeless—at least in my view—given the meager and sobering results of disputes on the difference between the empirical (in the sense of observable) and theoretical (in the sense of nonobservable) not only in the camp of logical positivists in the early 1930s but also between logical empiricists and post-positivists in the 1960s and 1970s[4].

As a more passable approach appears to me the approach that views a method applied in science as a set of instructions (usually in the form of imperatives) for how to perform certain steps[5]. As central there appear here two types of instructions: *selective* and *executive*. The former instruct the agent applying the method to pick up an (abstract) entity or set of entities from a given, explicit knowledge base and provide it to the operational knowledge base in the sense of a knowledge base already accessed or accessible by the agent. Thus, a selective instruction is a mediating step between a state of the explicit knowledge base and a state of the operational knowledge base and at the same time the instruction just retrieves the information already included in the explicit knowledge base and provides it to the operative knowledge base.

*Executive* instruction instructs the agent how to perform an actual step of a procedure formulated in the method; this step mediates between states of the operational knowledge base.

In order to understand when a method of science turns into an analytic one, one has to introduce the notion of the *implicit knowledge base* in the sense of

[3] For additional information on this method, see (Blalock 1964).

[4] On the former see (Carnap 1936); on the latter, see (Feigl 1970) and (Feyerabend 1962).

[5] Here I draw on (Kosterec 2016).

the logical closure of the explicit knowledge base[6]. An *analytic* executive instruction can then be viewed as an executive instruction acting on the operational knowledge base by adding to it *only* information given in the implicit knowledge base.

The importance of the analytic executive instruction as a part of the method of science can then be readily seen: It enriches the operational knowledge base that is at the disposal of the agent applying this method. Stated otherwise, the employment of an analytic executive instruction enables the agent employing this instruction, to acquire the information inherently given in the implicit knowledge base and then, subject it to further transformations by applying to it some additional instructions.

Finally, *a method of science is analytic if all executive instructions involved in it are analytic*.

I will now apply such an instructional view on the analytic methods of science to my methodological treatment of the causal methods used in sociology.

## Analytic methods in causal reasoning of sociology

*Preliminaries*

Analytic methods are usually applied to sets of data that were acquired in the course of direct interaction with an object (or objects) under investigation and where the data are initially subjected to statistical treatments. The conceptual framework driving the interaction acquires the form of questionnaires, while the statistical treatment of data is driven by the requirement to obtain input values for certain variables that are, then, the proper subject-matter of the analytic methods. Some of these variables are viewed as dependent variables, while others are viewed as independent variables.

The causal treatment of both these two types of variables then tries to turn the independent variables into the explaining variables (*explanantia*) and the dependent variables into explained variables (*explananda*), very often, by describing a causal structure or mechanism.

R. Boudon characterized the task faced here by sociology by means of the following two questions (1967: 32):

> 1. How can one determine rigorously, given a set of dependent and independent variables, the hypothesis about a causal structure so that it is compatible with the results of observation?

[6] Following (Kosterec 2016), I understand under closure of the explicit knowledge base a union of the *validity of closure* of this base and the *closure on logical entailment* of this base. The former contains all sentences which are true whenever all sentences of the explicit base are true; the latter contains all the logical consequences of sentences included in the explicit knowledge base.

2. How does one evaluate the intensity of action of one variable on the other or compare the action of different explanatory variables on the explained variables?

From this it is then readily seen that in addition to the methods of statistical treatment of basic (primary) data, a conceptual framework has to be provided, standing for a hypothesis presenting (i) a list of variables, (ii) the classification of variables into dependent and independent variables, respectively, and (iii) propositions about the causal relations between these two types of variables.

This means that with respect to the application of analytic methods to variables, the sociologist has to make a preliminary decision by stating a hypothesis, whatever its tentative status may be. The existence of such decision is acknowledged as a fact by sociologists. So, when Cox and Wermuth refer to the notion of causality, they consider the case of association between two features of certain entities (people, communities, households, etc.), which they denote as *C*—, cause, and *R*—, response (effect). A situation may then arise wherein entities with high values of *C* may tend to display also high values of *R* and vice versa. The question one faces is, "What might it mean to conclude that *C* is a cause of response *R*?" (Cox – Wermuth 2001: 65)

In order to provide an answer to this question, Cox and Wermuth differentiate between *symmetric* relations and *directed* relations in the sense that association is a symmetric relation—that is, if *C* is associated with *R*, then *R* is associated with *C* as well. Causality, on the other hand, is asymmetric in the sense that if *C* causes *R*, then *R* does not cause *C*. From this the authors derive the conclusion that this kind of directionality "is not about statistical significance, but rather is concerned with substantive interpretation". (2001: 65)

The requirement of a substantive interpretation in the sense of interpretation by means of a substantive theory is also emphasized by Simon, who transformed this general reasoning about the relation between cause and effect into the language of variables appearing in equations. In (1980) he considered, as an example, two variables: *x*—, which represents the number of years of schooling, and *y*—, which represents verbal abilities of adults from a certain sample.

The task is to find out how adults' verbal abilities affect the amount of education they obtain. The equation for this task he states as follows:

$$x = Ay + B \qquad (1)$$

Here *A* stands for the expected number of years of additional education for each increase of verbal activities by a unit. One could presuppose that the relation is a reversed one—namely, that the verbal activities are determined by the number of years of schooling. This relation is expressed by Equation (2):

$$y = Cx + D \qquad (2)$$

Here *C* is interpreted as the increase in verbal activity produced by each addition of a unit (say, year) of education.

We have here two different interpretations of the relation of the variables *y* and *x*, and where the difference in interpretation "arises, not from algebra—the two equations are algebraically indistinguishable, each being derivable from the other—but from our attribution of two completely different *causal mechanisms* to them". (Simon 1980: 66) In Equation (1) the causal mechanism supposed to be at work is such that it determines "at each stage in the education process, which student would continue and which would terminate their education … if these decisions depended upon the students' verbal activities". (1980: 66) In Equation (2) it is supposed that the educational mechanism causes an increase in the verbal activities of students.

The choice between these two hypotheses about the causal mechanism being at work cannot be made, according to Simon, by applying analytic means of statistics; on the contrary, "we must make *a priori* assumptions about the mechanisms that underlie the behavior of the variables". (1980: 69)

In addition to the requirement of providing a substantive conceptual treatment of causality being at work in the entities under investigation, this treatment is in sociology usually translated into a set of graphs. A graph from this set should be composed of nodes (vertices) connected by directed edges, so that the nodes correspond to variables while the edges are directed in such a way that at their tail is located the symbol for the explaining variable (cause) while at its arrow stands the symbol for the explained variable (effect).

The moral of what was said till now is thus twofold. *First*, causal reasoning in sociology involves reasoning that is *analytic in nature*. This analyticity was labeled by Simon as a feature of an *"automatic" science* in the sense of "a technology—a set of procedures that can be applied to data" (1980: 75), while Kenny stated that this technology "is especially useful for showing that seemingly, theoretically meaningful relations between variables are, in fact, only *mathematical necessities*". (Kenny 2006: 24; emphasis added) This technology, yielding mathematical necessities will be dealt with in the next section.

*Second*, and at the same time, that technology has to be unified with substantive conceptual treatment of the causal process in the entities under investigation.

*The Simon-Blalock method*

The S-B method is based on Simon's idea that once it is possible to prove that there exists a nonzero correlation between two variables, then this can be viewed as evidence for the existence of a causal relation between these variables.

Simon initially states the following question: "[A]re there any operational means for distinguishing between true correlations, which do imply causation, and spurious correlations, which do not?" (1954: 467) He answers this question by delineating a procedure composed of the following six steps (1954: 468):

> [1.] We begin with a set of observations of a pair of variables, *x* and *y*.
> [2.] We compute the coefficient of correlation, $r_{xy}$, between the variables[7].
> [3.] Whenever this coefficient is significantly different from zero, we wish to know what we can conclude as to the causal relation between the two variables.
> [4.] If we are suspicious that the observed correlation may derive from "spurious" causes, we introduce a third variable, *z*, which, we conjecture, may account for this observed correlation.
> [5.] We next compute the partial correlation, $r_{xy \cdot z}$, between *x* and *y* with *z* "held constant" and compare this with the zero order correlation, $r_{xy}$.
> [6.] If $r_{xy \cdot z}$ is close to zero, while $r_{xy}$ is not, we conclude that either (a) *z* is an intervening variable—the causal effect of *x* on *y* (or vice versa) operates through *z*—or (b) the correlation between *x* and *y* results from the joint causal effect of *z* on both these variables and hence this correlation is spurious.

The procedure composed of these steps can be applied to an entity (or entities) under investigation once the following suppositions are fulfilled:
1. To the entities under investigation are assigned various types of variables: *exogenous* variables (determined with respect to the entities from the outside and never by other exogenous variables); *implicit* variables (labeled also *error* terms or *disturbance* terms); *endogenous* variables (determined by exogenous and implicit variables).
2. All these types of variables together set up a *model*, which should fulfill the following four conditions[8]:
(i) *unidirectionality* of causal relations between variables (reciprocal relations and feedback loops between variables are excluded)
(ii) *linearity*—that is, no variable is given in the form of an exponent, or multiplied/divided by another variable and the variable standing for the effect is given only in the first power[9]
(iii) *separability* and *additivity*—that is, the endogenous variable is viewed as the sum of two separate components: the implicit variables and the explicit variables;
(iv) *implicit variables* are neither pairwise correlated nor do they have a confounding influence on the causal relations between the explicit variables.

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[7] Formulas used for the computation of $r_{xy}$ are stated below.

[8] Here I benefited from (Russo 2009: 58-59).

[9] For technical details of this, see (Kenny 2006: 312-313).

A model in which are involved the types of variables listed above and which fulfill conditions (i) through (iv) is labeled a *recursive* model. The S-B method is applied to such a type of model in the following manner[10].

Initially, for the variables $x$ and $y$ we use the statistical data on their actual values (data points) $x_i$, $y_i$ ($i$ = 1, 2, …, $n$) in order to compute their respective *means*; the formulas here are $\overline{X} = \frac{1}{n}\sum_{i=1}^{n} x_i$, $\overline{Y} = \frac{1}{n}\sum_{i=1}^{n} y_i$. Then, we compute the *standard deviation* for each data point of the respective variable by means of the formulas $s_x = [\frac{1}{n}\sum_{i=1}^{n}\left(x_i - \overline{X}\right)]^{½}$, $s_y = [\frac{1}{n}\sum_{i=1}^{n}\left(y_i - \overline{Y}\right)]^{½}$. Next, we compute the standard value of each data point for the respective variable; the formulas here are $X_i = \frac{1}{s_x}\left(x_i - \overline{X}\right)$ and $Y_i = \frac{1}{s_y}\left(y_i - \overline{Y}\right)$. The final step leads to the computation of the correlation coefficients $r_{xy}$, measuring the degree of dependence between variables $X$ and $Y$ appearing in the recursive model. The formula used for this is as follows:

$$r_{xy} = \frac{1}{n}\sum_{i=1}^{n} X_i \times Y_i \qquad (3)$$

The correlation coefficients for the respective variables then serve as inputs for the very S-B method; on their basis it is then possible to compute by means of pregiven formulas the correlations between variables in models with more than two variables. Let me take, as an example, a model with three variables $X$, $Y$, and $Z$ and thus involving three possible correlations between them[11].

Two of these correlations can be represented by means of the following diagrams:

Figure 1: **Two alternative causal models with three variables**


The correlations between the variables can then be computed by the respective formula. For model (a) $r_{yz} = r_{xy} \times r_{xz}$ and for the model (b) $r_{xz} = r_{xy} \times$

[10] In what follows, I am indebted to (Schenk 2013) for offering valuable insights.

[11] This case is dealt with in (Blalock 1960). The formula for computing the number of possible correlations, when reciprocal causation is not taken into account, between $k$ variables is $\frac{1}{2}\,\frac{k!}{k-2}$.

$r_{yz}$. In model (b), the correlation between *X* and *Z* is given only due to two separate causal actions: *Y* on *X* and *Y* on *Z*. If we want to know whether there exists a correlation between *X* and *Z* independent of the action of *Y*, we apply Simon's procedure of holding *Y* constant and compute the partial correlation coefficient $r_{xz.y}$ by applying the following formula:

$$r_{xz.y} = [r_{xz} - r_{xy} \times r_{zy}]/[(1 - r_{xy}^2) \times (1 - r_{zy}^2)]^{½} \qquad (4)$$

In case this formula yields for the respective correlation coefficients a zero or a close to zero value, then the correlation between the variables *X* and *Z* can be viewed as spurious—that is, as not originating in a direct causal linkage. The technique applied here can be generalized to four, five, or even more variables.

Let us now consider, from the point of view of the S-B method, the following two causal models[12]:

Figure 2: **Two alternative causal models with four variables and three arrows**

W → X → Y → Z (a)  Z → Y → X → W (b)

For model (a) $r_{wz} = r_{wx} \times r_{xy} \times r_{yz}$, while for model (b) $r_{zw} = r_{zy} \times r_{yx} \times r_{xw}$. But, given the formula (3) by means of which the correlation coefficients are computed, it holds that $r_{xy} = r_{yx}$—that is, the correlation coefficients are symmetric as to the reversal of their variable-subscripts.

The same kind of indifference as to the direction of causal impact of the S-B method is also given for more complex causal models, for example, for the following two[13]:

Figure 3: **Two alternative causal models with four variables and five arrows**


(a) (b)

For both models, according to the S-B models, $r_{14.23} = 0$.

[12] This model is dealt with in (Blalock 1960).

[13] This example is taken from (Boudon 1967: 86).

So, once we want to choose between models (a) and (b) from Figure 2 and Figure 3 as two competing hypotheses, then the S-B method is by itself of no help. From this, Blalock draws the conclusion that "[w]e must rely on other grounds—theoretical reasoning, knowledge of time sequences, or even common sense—to choose between these two models". (1960: 630)[14]

Blalock then characterizes the *logic of the procedure* involved in the S-B method as follows (1962a: 545):

> We postulate or assume a given causal model. Undoubtedly, in doing so we make use of whatever theoretical reasoning or previous data we have available. *If* the given model is correct, we can show (deductively) that certain empirical relationships should hold among the magnitudes of the correlation coefficients, which themselves are perfectly symmetrical. We then check to see, whether or not these predictions hold. If they do not, we reject or alter the model. But if the predictions hold … we merely hang onto the model since there may be a number of alternative models which also predict the same results. It is precisely here that we must rely on additional information, such as knowledge of temporal sequence or theoretical arguments. If we are to rule out these alternative theories, we cannot do so on the basis of the correlations alone.

What conclusions can be drawn from the analysis of the S-B method?

First, this method is *analytic by its very nature*. It fulfills the already given delineation of the analyticity of a method because the formulas for the computation of the respective means $\overline{X}$, $\overline{Y}$ from the data points $x_i$, $y_i$ together with the formulas for the computation of the standard values of $X_i$ and *Yi* of each data point and the formulas (3) and (4) make only explicit what is already implicitly given in the set of those data points. But even if these formulas make explicit only what is given in the respective set of data points, still their irreplaceability consists in making what is explicitly available for further processing by shifting it from the implicit knowledge base to the operational knowledge base.

For a better understanding of this analyticity, let me turn to Blalock's reasoning (1962b) on models with four variables $X_1$, $X_2$, $X_3$ and $X_4$ which can form six pairs[15]. In order to apply the S-B method for the purpose of testing the respective causal models, we have to eliminate at least one arrow, thus we can consider only models with at most five arrows. In case we consider only two arrows as being at work between four variables, we obtain two separated causal relations, for example $X_1 \rightarrow X_2$ and $X_3 \rightarrow X_4$. Thus, we are left with just three possible situations: five-arrow, four-arrow, and three-arrow models.

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[14] On this problem, see also (Blalock 1962a).

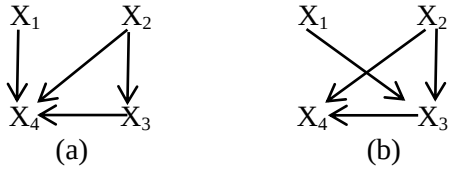
[15] The formula for the computation of the number of pairs that can be formed from *k* variables is stated in note 11.

The analytic nature of the S-B method is readily seen in each of these three options. For the case of five arrows we can generate by means of formulas of combinatorics a whole set of several alternative models, for example the following two[16]:

Figure 4: **Two causal models with four variables and five arrows**

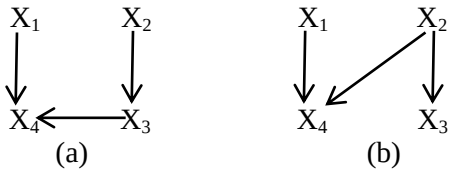

We predict for model (a) that $r_{12} = 0$ and for model (b) that $r_{13.2} = 0$, and then, by applying the instructions of the S-B method, compute—by drawing on the already computed correlation coefficients, the actual values of both these coefficients. For the four-arrow case we also automatically obtain a whole set of several alternative models—for example the following two.

Figure 5: **Two causal models with four variables and four arrows**




For model (a) we predict that $r_{12} = 0$ and $r_{13} = 0$ and, then, by applying the analytic instructions compute the actual values. The same holds for model (b), where we predict that $r_{12} = 0$ and $r_{14.23} = 0$. Finally, for the case with three arrows we can generate several alternative models—for example the following two.

Figure 6: **Two causal models with four variables and three arrows**




[16] The number of possible combinations computed by means of these formulas is reduced due to the imposition of the requirement that causal loops are excluded.

Here, for model (a) we predict that $r_{12} = 0$, $r_{13} = 0$, and $r_{24.3} = 0$, while for model (b) we predict that $r_{12} = 0$, $r_{13} = 0$, and $r_{34.2} = 0$. These predictions can then be compared with the actual results of the computations based on the analytic instructions in the S-B method.

Second, the S-B method, in order to be applied, requires that certain *decisions be made prior to its employment*. Here I mean: (i) the decision as to the direction of causal action between the variables involved in the model, and (ii) the decision to state the model as recursive.

Third, the employment of S-B method unifies two aspects. On the one hand, it is used to test the predicted correlations between variables given in a certain model. But, on the other hand, the point of departure of the employment of the S-B method is a certain, pregiven number of variables whose number should never change in the course of this employment; *no variables are removed from the initial set and no new variables are introduced into this set*.

As I will show in Section 4, the employment of analytic causal methods in sociology depends not only on the decision—made prior to the employment of these methods—about which variables are to be used, but also on decisions about which variables are in the course of that employment excluded as causally irrelevant and about which new variables have to be introduced in order to understand the causal relations at work in the entities under investigation.

## A case study in the application of analytic methods: Durkheim's *Le Suicide*

I have chosen Durkheim's *Le Suicide* as a case study of the application of analytic methods in sociology despite the fact that he did not employ the method of correlation coefficients. The reason for my choice is that even in the absence of this method, Durkheim dealt with the problem of causal inference based on statistical data and solved it by employing such crucial elements of this inference as *variables*, *interaction between variables*, *elimination of interaction between variables*, and *proposal of causal models*.

The instruction driving the methods employed in *Le Suicide* is "that social facts must be studied as things, that is, as realities external to the individual". (1897: ix) This claim on the thing-like nature of social facts then determines his research into the nature of suicide as follows (1897: 2):

> Our first task … must be to determine the order of facts to be studied under the name of suicides. Accordingly, we will inquire whether among the different kinds of death, some have common qualities objective enough to be recognizable … [as] specific enough not to be found elsewhere … The essential thing is … to establish a category of objects permitting this classification, which is objectively established, that is, corresponds to a definite nature of things.

Then, he reflects on the notion of suicide and delineates it as follows: "*We call suicide any case of death resulting directly or indirectly from a positive or negative act accomplished by the victim herself and which she knew would produce this result*". (1897: 5)

Contrary to the above given instruction to study social facts as entities (things) external to the individuals, the delineation of the notion of suicide refers to an act of an individual. Durkheim, however, insists on a sociological investigation into individual suicides which follows that instruction; (1897: 8):

> If, instead, of seeing in them only particular occurrences, isolated one from another and requiring to be separately studied, the suicides committed in a given society during a given period of time are taken as a whole, it appears that in such a way obtained total is not simply a sum of independent units… but constitutes by itself a new fact *sui generis*, which has its own unity, individuality and consequently its own nature and, furthermore—this nature is eminently social.

In order to support his claim about the supra-individual nature of suicide, he brings in his first table of data listing the absolute number of suicides for several European countries in the years 1841 – 1871 which, he claims, are almost invariable. The cause of this invariability he locates in the relative stability of circumstances attending the life of nations during these years. So, "each society at each moment of its history has a definite aptitude for suicide". (1897: 10) To this aptitude he assigns a measure being equal to the ratio of all suicides in a country to one million (or one hundred thousands) inhabitants of this country; this measure he labels as the *rate of mortality through suicide*. This measure he employs in the reasoning on the causes of suicide.

*Analytic methods in elimination of extra-social factors as causes of suicide*

Durkheim differentiates between three kinds of extra-social causes that could, possibly, have an impact on suicide, the latter already conceptualized as the suicide-rate variable: *organic-psychic dispositions*, further differentiated into abnormal and normal ones, certain *characteristics* (climate and temperature) *of the physical environment*, and the psychological factor of *imitation*. I deal in this article only with those dispositions.

When analyzing the impact of *abnormal* organic-psychic dispositions, Durkheim initially provided a typology of insane suicides and then tried to find out if all cases of voluntary death could be subsumed under one of these types. Based on this typology, he showed that any suicide committed by an insane person is either devoid of any motive or has purely imaginary motives; but the majority of suicide motives are anchored in reality and cannot thus belong to any type of insane suicide.

As another possible cause of suicide, Durkheim considered anomalies labeled *neurasthenia*. But because he lacked statistical data as to the correlation

between the occurrences of suicide and of neurasthenia, he embarked on an alternative strategy. Instead of neurasthenia he considered the correlation between *nervous degeneration* and suicide, and because, in his view, insanity is only a stronger form of nervous degeneration, the variation in the number of nervous degenerations will be proportional to occurrence of insanity. Making this change, he could then substitute the correlation between insanity and rate of suicide for the correlation between nervous degeneration and suicide.

This reflection he then performed on the background of social actions having an impact on the suicide rate. He declared the following (1897: 36-37):

> To measure the effect the psychopathic states can have on suicide, one must eliminate cases where they vary as do the social conditions of the same phenomenon; for when these two factors tend in the same direction the share of each cannot be determined in the final result. They must be considered only where they are in inverse proportion to one another; only when a sort of conflict exists between them can one learn which is decisive.

Durkheim, thus, reflected here on the joint causal impact of two factors—insanity and social conditions—on suicide as their common effect.

In order to disentangle this joint impact, he brought in the dichotomic variable *sex* and then compared the insanity rate of males and of females with the suicide of males and of females. He found out that even if women have a predisposition to insanity at least as great as that of men, still the actual data on the difference between the suicide rate of women and men in several European countries for many years indicated that suicide is essentially a male phenomenon; for every female suicide there were four male suicides. (1897: 39)

From the point of view of causal reasoning, by bringing in the dichotomic variable of sex, Durkheim changed his initial causal model (Figure 7) to the model shown in Figure 8.

Figure 7: **Durkheim's initial causal model for the relation between insanity and suicide**

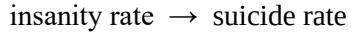
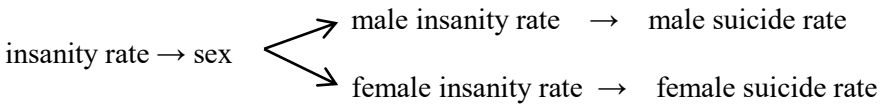


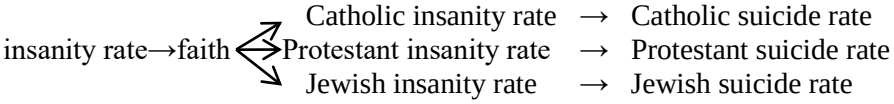

Figure 8: **Durkheim's causal model for the relation between insanity, sex and suicide**



With respect to this model, he then declared the following: "Each sex has … a definite tendency to suicide which is even constant for each social environment [= a country in different years]. But the intensity of this tendency does not vary at all in proportion to the psychopathic factor" (1897: 39).

As a variation of the above stated change in the causal model, Durkheim then brought in the variable of *religious faith*, which, for countries he took into account in his statistics, he viewed as a trichotomic variable: Catholic faith, Protestant faith, and Jewish faith. He then reflected on the causal model shown in Figure 9.

Figure 9: **Durkheim's casual model for the relation between insanity, religious faith, and suicide**




Then, by comparing the rates represented here in the vertical and horizontal, Durkheim found out that even if Catholics have a somehow lower tendency to insanity compared to Protestants, Catholics have a much lower rate of suicide than Protestants. An even greater disparity was identified by Durkheim in the relation between the suicide rate and insanity rate for Jews. While the insanity rate among Jews was much higher than among Catholics and Protestants, the suicide rate among Jews was much lower; here "*suicide varies in inverse proportion to psychopathic states*, rather than being consistent with them". (1897: 40)

Next, Durkheim introduced a new variable—namely, *age*— and then compared for various European countries, on the one hand, the dependence of the suicide rate on age with, on the other hand, the dependence of insanity rate on age. He found out that in all countries considered, the suicide rate gradually increases—from childhood (below 16 years) to beyond age 60 (above 60 years for all countries, for some above 70 and some even for above 80) while insanity reaches its peak at the age 30 and then declines to a minimum in old age. From this disparity he drew the conclusion that such "a contrast would not be explainable if the causes of the variation of suicide and those which determine mental disorders were not of a different nature". (1897: 40)

After dealing with abnormal mental states, Durkheim turned to *normal mental states*. Initially, he considered racial differences as indicators of such normal mental states, but because he viewed the notion of race as delineated not clearly enough, he shifted to the concept of *nationality* in the sense of a racial, that is, non-social characteristic. In order to find out whether nationality in this sense had an impact on suicide, he combined the suicide and nationality

statistics of Austria. The reason for picking this country was that it provided the data required "for answering this question … The Germans are mixed in the various provinces in differing proportions with a population of totally different ethnic origins". (1897: 60) The data from these combined statistics showed, however, that there was no detectable correlation between the rate of being German and the rate of suicide in the respective provinces of Austria.

In order to test the validity of this conclusion, Durkheim applied a new strategy—namely, that of relating the nationality-rate to the rate of suicide while holding the variable of *religious faith* constant. In order to do so, he compared French- and German-speaking cantons in Switzerland, whose populations share the same faith (Protestant or Catholic). He found out that among Catholics there was no difference in suicide rate between persons of German nationality and persons of French nationality, while among the Protestants, the French had a higher suicide rate than the Germans. The cause of the difference between the German suicide-rate and that of other nations, he concluded, was "not in the blood which flows in their veins but in the civilization in which they are reared". (1897: 63)

*Analytic methods in the determination of social factors as causes of suicide*

After eliminating all the variables referring both to the organic constitution of individuals and to characteristics of the physical environment as possible causes of suicide, Durkheim turned to social causes of suicide, the latter being viewed by him as a collective (supra-individual) phenomenon. He distinguished three kinds of causes of suicide: egoism, altruism, and anomie and to each of them he assigned the corresponding type of suicide. From his four fold typology of suicides—egoistic suicide, altruistic suicide, anomic suicide and fatalistic suicide—I address in this article only the causal analytic methods applied by Durkheim to the egoistic type of suicide.

His starting point was an investigation into correlation between religious faith and suicide. By comparing the data on this correlation drawn from statistics for several European countries he identifies a high correlation in Protestant countries and a low correlation in Catholic countries. Then, in order to eliminate other possible factors that could have an impact on the suicide rate, he focused on the difference between the Protestant faith and the Catholic faith in just one country—Germany. He does so by differentiating between the Catholic Bavaria and Protestant states and shows, by drawing on the respective statistics, that Bavaria has a much lower suicide rate.

He found this same difference by making two other comparisons. First, he focused on Bavaria itself and compared the provinces with the highest percentage of Catholics with those that owing to the presence of a Protestant population had a lower percentage of Catholics. Second, he drew on statistics

for the French and German cantons in Switzerland and showed (i) that both Catholic French and Catholic German cantons had a substantially lower suicide rate than both Protestant French and Protestant German cantons and (ii) that the same held true for all cantons of all nationalities.

From all that Durkheim drew the conclusion that religious affiliation is the most dominant factor compared with other factors (like, for example, nationality) affecting suicide. What he then presented was an attempt at a hypothesis to explaining his conclusion. His hypothesis is as follows (1897: 156-157):

> The only essential difference between Catholicism and Protestantism is that the second permits free inquiry to a far greater degree than the first … the Catholic accepts his faith ready-made, without scrutiny … A whole hierarchical system of authority is devised … to render the tradition invariable. All *variation* is abhorrent to Catholic thought. The Protestant is far more the author of his faith. The Bible is put in his hands and no interpretation is imposed upon him. The very structure of the reformed cult stresses this state of religious individualism.

After stating this hypothesis, Durkheim undertook a series of moves aiming at a confirmation of this hypothesis, which involved the introduction of new variables. The variable of *number of priests* he introduced to explain the fact, *prima facie*, contradicting his claim about the higher proclivity of Protestants to suicide as compared to Catholics, that in England the rate of suicide is much lower than in the reformed societies in Germany.

This difference he explained by claiming that corresponding to the hierarchically organized clergy in England's reformed church there is an inner unity that is incompatible with a pronounced religious individualism. As an indicator of the binding bond of England's reformed faith he chose the ratio of church-goers per one priest, which is much higher in the Church of England than in other reformed churches on the European Continent. To justify this he provided the following explanation: "The more intense religious life, the more men need to direct it. The greater the number of dogmas and precepts the interpretation of which is not left to the individual consciousness, the more authorities are required to give them meaning". (1897: 161)

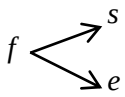
Another variable—namely, *education*—was introduced in the context of another proof of his explanatory hypothesis. This proof was based on the following two claims: "1, the desire for learning must be stronger among Protestants than among Catholics; 2, in so far as this denotes a weakening of common beliefs it should vary with suicide, fairly generally". (1897: 162) The first claim was proved by him by drawing on statistics from 1877 – 1878 which showed that for each 1.000 children age 6 through 12 years, in Protestant countries an average of 957 children attended school, while in Catholic

countries an average of 667 attended school; this difference was preserved also in other years.

The second claim is given a special interpretation by Durkheim—namely, that education by itself (independent of the impact of religious faith) causally acts on the suicide rate in the sense that the higher the level education in a population, the higher its suicide rate and wherein the validity of this interpretation is proved by holding the variable of religious faith constant. The procedure Durkheim employs here is that of investigating the correlation of level of education and rate of suicide inside exclusively Catholic and Protestant communities, respectively. So, for example, for Catholic communities he looks for a correlation between the percentage of literacy and rate of suicide by examining data for married couples in Italian provinces and French departments, while the data for Protestant communities are taken from statistics for German states.

Thus, Durkheim initially employed the causal model ($f$ stands for the variable of religious faith and $s$ for the suicide rate) $f \rightarrow s$ and then the causal model $f \rightarrow e$ ($e$ stands for education)—that is, he held to the causal model shown in figure 10.

Figure 10: **Durkheim's initial causal model for the relation between faith, suicide, and education**




The relation between correlation coefficients corresponding to this model is $r_{se} = r_{fs} \times r_{fe}$. But then, dealing with education as a cause, which has—independent of the impact of religious faith—an impact on the rate of suicide, Durkheim moves to the causal model shown in Figure 11.

Figure 11: **Durkheim's modified causal model for the relation between faith, suicide, and education**


By translating this causal model into the language of correlation coefficients, at least the following three inequalities should hold: $r_{fs} \neq 0$, $r_{fs.e} \neq 0$, and $r_{es.f} \neq 0$.

It remains, however, an open question whether the proof of $r_{es.f} \neq 0$ is really possible, as intended by Durkheim, by drawing on the procedure and thus the

statistical data he actually used. The problem I see as inherent to his approach is that while he held the variable *f* constant, still this constant was *different from zero*—his data were always data taken from *religious* communities. Stated otherwise, controlling for the variable *f* so that is does not vary between its possible values (for example, Catholic and Protestant) but still *standing for religion* reduces the correlation between the variables *e* and *s*, but does not eliminate it. So, a real proof of the validity of the causal model $e \rightarrow s$ as well as the formulation of the quantitative relation between these variables should be based on data on the correlation between level of education and rate of suicide drawn from *non*-religious (secularized) communities.

As a conclusion of my reconstruction of Durkheim's employment of analytic methods in reasoning about egoistic suicide, let me turn to his reasoning about the relation between the variables of rate of suicide and age, on the one hand and, on the other hand, a new variable: *marital status*. The reason for this is given by Durkheim as follows: "if religion preserves [man] from suicide only because and in so far it is society (*société*), it is probable that other societies have the same effect. From this point of view let us consider the family". (1897: 174)

The absolute numbers taken from the statistical data used by Durkheim showed that unmarried persons committed suicide more often than unmarried ones. From this, one could, seemingly, draw the conclusion that marriage increases the probability of suicide. This conclusion was, however, refused by Durkheim by showing that by using those absolute numbers, one loses sight of the confounding influence of the variable of age—namely, that while a very large number of unmarried persons are below 16, the great majority of married persons are well above this age.

To obtain the correct relations between variables, Durkheim applied a two-stage strategy. First, he looked for the number of suicides for the group of persons under the age of 16 while relying on the fact that the majority of these persons are unmarried—that is, their marital status can be viewed as a constant. Second, he showed—by drawing now on already purified data—that the suicide rate here was extremely low (in France, 2 suicides per million inhabitants).

The instruction he thus applied, he described as follows: "if one wants to compare the two populations [married, unmarried] to find out the influence of the marital status and that alone, one must rid oneself of this disturbing element and compare with the married persons only the unmarried above 16 while eliminating the others" (1897: 175). Applying this instruction he then showed that celibacy causes a certain increase in the suicide rate. In order to determine this increase more precisely, he applied yet another instruction, to the initial data—namely, comparing only those data on suicide for which the married and

unmarried persons are from the same age group—that is, Durkheim applied here the procedure of *holding the possible values of the variable of age limited to a certain interval*. The reason for applying this instruction was that while the average age of unmarried persons (in France) was below 30 (for both sexes), the average age of married persons was between 40 and 45 years.

In a next step, Durkheim changed the very nature of the variable marital status—namely, from a *dichotomic* one (nonmarried, married) to a *trichotomic* (nonmarried, married, widowed). This change enabled him then to compare mutually the rates of suicide corresponding to their respective marital statuses. Worth mentioning here is that by turning the variable of marital status into a trichotomic one, he was able to perform a highly fine-grained sociological investigation applied to the suicide rate of women and men in all three groups—for the unmarried: bachelor, bachelorette—for the married: husband, wife; and for the widowed: widower, widow.

A similar strategy aiming at a more fine-grained investigation into the relation between family status and suicide can be found in Durkheim's additional characterization of the social relations inside the family—namely, by bringing in addition to the relation of husband-wife also the relation parents-children.

The lesson from all this is that by bringing in additional variables as well as by changing their nature (for example, by the change from a dichotomic variable one to a trichotomic one) in the course of the research into egoistic suicide, Durkheim gradually made the *network of employed social variables denser and denser*. Based on such an increasing variable-density, he then, first, performed data extracting from already available statistics on suicide, where data searched for were those that pertained to these new or changed variables. Second, based on this extracting, he investigated into the correlation of these variables with respect to the rate of suicide and, then, stated a hypothesis pertaining to the causal relations between them. Third and finally, he tested this hypothesis by drawing on the already available data by employing yet other, newly introduced variables.

These three research steps applied by Durkheim to the respective pairs of variables falling under the variable *marital status* from Chapter 3, Book II of *Le Suicide* are symbolized by means of the sign "+" in the cells of Table 1[17]. The sign "+ age" indicates that Durkheim investigated into the correlation of suicide rate in the respective marital category with the variable of age. The sign "–" indicates that he did not apply, in this chapter (to best of my knowledge), the above mentioned three steps to find out the correlations and causal relations between the respective variables and the rate of suicide.

[17] This chapter is viewed by Durkheim as a continuation of his reflections on egoistic suicide. The abbreviation "child." stands here for "children."

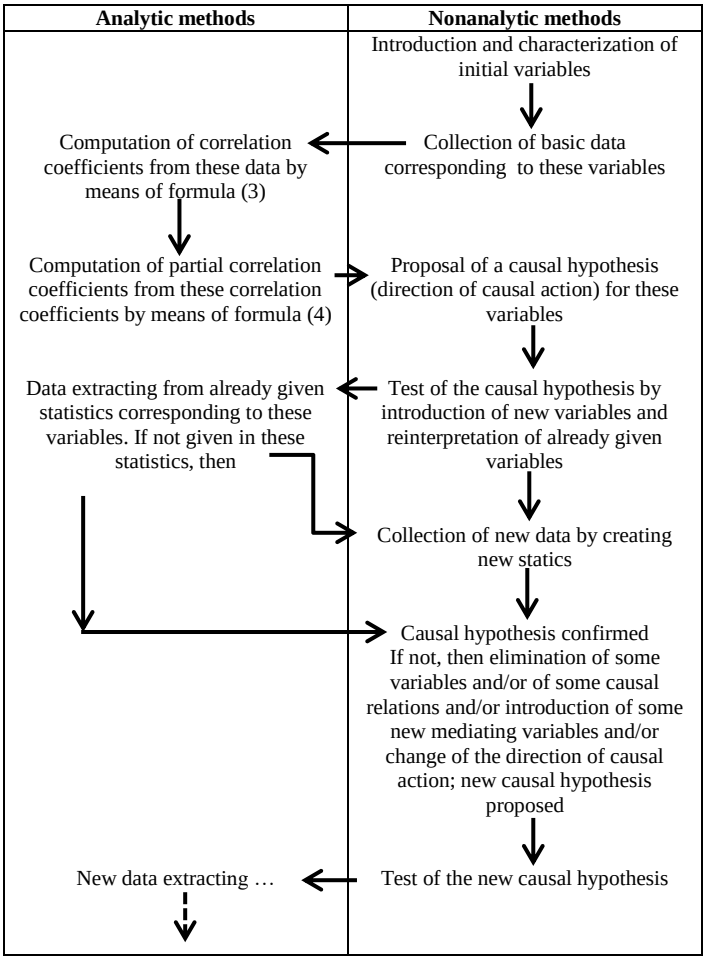
Table 1: **Durkheim's research into correlations and causal relations between family variables and suicide**

| Suicide committed by / Suicide committed by | Married persons | Bachelors | Bachelorettes | Husbands | Husbands without child. | Husbands with child. | Widowers |
|---|---|---|---|---|---|---|---|
| **Unmarried persons** | + | – | – | – | – | – | – |
| **Bachelors** | – | + age | + | – | + | + | – |
| **Bachelorettes** | | | + age | | | | |
| **Wives** | – | – | – | + | – | – | – |
| **Wives without child.** | – | – | + | – | + | – | – |
| **Widows** | – | – | – | – | – | – | + |
| **Widows without child.** | – | – | + | – | – | – | – |
| **Widowers with child.** | – | – | – | – | + | – | – |

## Conclusions

The aim of my article was to analyze causal analytic methods used in sociology. I focused on the S-B method and on the methods employed by Durkheim in *Le Suicide*. An overview of results attained is given in Figure 12. The left side lists the type and nature of analytic methods dealt with in this article and the right column lists the non-analytic methods; the arrows indicate the movements between them performed in the research process.

Figure 12: **Analytic and nonanalytic methods described in this article**

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