A definition of the causal effect of a political party's nominee on the U.S. general presidential election using counterfactual response types

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Abstract

The electability of the candidates for the 2020 Democratic U.S. presidential nomination was frequently debated. Arguments regarding a candidate's electability often claimed that they would affect the general election by changing the behavior of a certain subset of eligible voters. For example, is it more important electorally that a candidate drive turnout or swing voting? As lay consumers of political opinion, we were having difficulty weighing these questions from a strategic standpoint. Although candidate electability is a nebulous term that might be interpreted in various ways, one interpretation of the term is a population-based causal question: What would the effect of the Democratic nominee be on the presidential election result? Population-based causal questions are commonly studied in epidemiology. To aid interpretation of electability arguments, we frame the question through a counterfactual model used in epidemiology. Specifically, we define the causal effect by characterizing the population of eligible voters into nine counterfactual response types. The definition clarifies our ability to interpret arguments regarding the electability of the candidates. For example, the causal effect can be subdivided into three parts: the effect of the nominee on (1) Democratic turnout, (2) Republican turnout, and (3) swing voting. We show using notation that the third part has twice the weight as the other two. The definition follows intuition. However, we hope its formalization using counterfactual response types may foster interdisciplinary communication.

Keywords

Counterfactual model; Causality; Politics

Background

The electability of the candidates vying for the 2020 Democratic U.S. presidential nomination was frequently debated [1–3]. Arguments regarding a candidate's electability often claimed that they would affect the general election by changing the behavior of a certain subset of eligible voters. Some claimed, for example, that a given candidate would

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drive voter turnout among those only considering Democrats, while others asserted that a candidate could gain the vote of those who may otherwise vote Republican [4]. As lay consumers of political opinion, we were having difficulty weighing these arguments from a strategic standpoint.

We are not political scientists. Nevertheless, politics affects public health [5], so we consider our uncertainty to be within the umbrella of epidemiology [6]. A core task of epidemiology, as with other social sciences [7], is to sharpen questions about populations so that they can be answered with data. The questions often concern causality. Although the word electability is used in various ways [8], one way to interpret the term is as a causal question about a population. In the context of the most recent Democratic presidential primary, electability essentially asked: What would the effect of the Democratic nominee be on the presidential election result? We do not speculate about the answer. Our aim is merely to illustrate how a counterfactual model used in epidemiology can clarify the question.

Specifically, we use counterfactual response types [9]. The framework is a special case of the potential-outcome (or counterfactual) model used throughout the social and biomedical sciences [10–12], including political science [13–17]. If both the outcome and the exposure (or treatment) are categorical, the causal effect can be defined in terms of the distribution of counterfactual response types [9,12,18]. If the exposure and outcome are both binary, then individuals are classified as one of four response types. Regardless of exposure, doomed people (type 1) will get the outcome, while immune people (type 4) will not. Types 2 and 3 are susceptible. Type 2 will get the outcome if they get the exposure but not otherwise, and type 3 people will get the outcome if they do not get the exposure but will not otherwise. A causal effect can then be defined using these response types. If the target population is everyone, the causal effect is the proportion in the population who are type 1 or 2 (those who get the outcome if exposed) minus the proportion in the same population who are type 1 or 3 (those who get the outcome if not exposed) [9].

Guided by this model, our goal is to define the population-level causal effect of a political party's nominee on the U.S. general presidential election result, with specific focus on the 2020 Democratic nomination. While electoral outcomes are commonly investigated through a counterfactual lens in political science [13,14,17], to our knowledge, counterfactual response types have not been explicitly considered. The definition using response types clarifies our ability to pose and interpret arguments regarding the electability of the candidates. For example, the definition highlights that the causal effect can be subdivided into three parts: the effect of the nominee on (1) Democratic turnout, (2) on Republican turnout, and (3) on swing voting. We show using the framework that the third part has twice the weight as the other two.

Method

The target population for the causal effect includes eligible voters in the 2020 U.S. presidential election. For simplicity, we assume the exposure is binary: Democrats could either nominate Joe Biden or Bernie Sanders. At this writing, Biden is the presumptive nominee. We chose those two for the illustration because they were the finalists. The

definition works for any two candidates and can be extended to more than two, as we elaborate in the Discussion. The outcome of interest is a person's voting behavior in the general election. Ignoring third-party voting, we consider three options: 1) voting for the Democratic nominee, 2) voting for the Republican nominee, or 3) not voting.

Potential outcome response types

We classified eligible voters into one of nine potential-outcome types (Table 1), according to how a nomination of Sanders or Biden would affect their voting behavior in the general election, if at all. The proportions are assumed to add to 1. The number of types is equal to the number of outcome possibilities (three, here) raised to the power of the number of exposure options (two). Accordingly, there are $3^2 = 9$ types in contrast with the $2^2 = 4$ types mentioned in the Introduction.

Regardless of the nominee, the result of the popular vote is the proportion of eligible voters voting Democrat minus the proportion voting Republican. Following Hernán and Robins [12], we introduce counterfactual notation wherein the nominee (the "treatment") is denoted as a superscript, taking either S for Sanders or B for Biden. If Sanders were the nominee, the popular-vote result, denoted as PVR^S, is the proportion who would vote Democrat, p_D^S, minus the proportion who would vote Republican, p_R^S. In terms of the types in Table 1, PVR^S is

$$PVR^S = p_D^S - p_R^S = (p_1 + p_3 + p_7) - (p_2 + p_5 + p_8)$$

Note, p_3 and p_7 represent the proportion voting Democrat because Sanders was nominated, while p_5 and p_8 represent the proportion voting Republican because Sanders was nominated. Meanwhile, p_1 would vote Democrat regardless, and p_2 would vote Republican regardless. Similarly, if Biden were the nominee, the popular-vote result, PVR^B, is

$$PVR^B = p_D^B - p_R^B = (p_1 + p_4 + p_8) - (p_2 + p_6 + p_7)$$

Definition of causal effect

Now that we have defined these two quantities, the causal effect (CE) can be defined as the difference between them: $CE = PVR^S - PVR^B$. In words, the CE is the popular vote result if Sanders were nominated minus the popular vote result if Biden were nominated. This quantity is, in our definition, the quantity of interest regarding candidate electability. If CE is greater than 1, Sanders would be more electable; if it is less than 1, Biden would be more electable. Expressing the causal effect in terms of the presented types,

$$CE = PVR^S - PVR^B$$
$$= [(p_1 + p_3 + p_7) - (p_2 + p_5 + p_8)] - [(p_1 + p_4 + p_8) - (p_2 + p_6 + p_7)]$$

Because p_1 and p_2 appear in both PVR^S and PVR^B, they cancel from the difference:

$$CE = [(p_3 + p_7) - (p_5 + p_8)] - [(p_4 + p_8) - (p_6 + p_7)]$$

Distributing the minus signs,

$$CE = [p_3 + p_7 - p_5 - p_8] - [p_4 + p_8 - p_6 - p_7]$$

$$CE = p_3 + p_7 - p_5 - p_8 - p_4 - p_8 + p_6 + p_7 \,.$$

Rearranging into an order that is easier to interpret,

$$CE = p_3 - p_4 + p_6 - p_5 + 2 \times p_7 - 2 \times p_8$$

$$CE = p_3 - p_4 + p_6 - p_5 + 2 \times (p_7 - p_8) \,.$$

The three differences in the last equality are interpretable as follows (Table 2).

Discussion

The definition of the causal effect of the Democratic presidential nominee on the U.S. general election may be obvious to many political scientists and strategists. We nevertheless find it illuminating to formalize the definition in a counterfactual framework of response types. Conceptual models and notation are useful for clarifying thought [19]. For example, two of the nine types are "doomed" to vote for a given party regardless of the nominee, while one type will not vote regardless of the nominee. As a result, the distribution of these three types does not impact the effect of the nominee on the general election. The remaining six response types are each susceptible to change their voting behavior based on the nominee and, accordingly, to contribute to the population-level causal effect. Their distribution in the population determines whether the popular vote for Democrats if Sanders were nominated would be higher or lower than that if Biden were nominated.

In Table 2, we interpret three parts of the effect definition. These components raise three questions about a Democratic candidate's electability in the general election:

1. Who would drive the most Democratic turnout (vs. not voting if the nominee were different?) The answer depends on the distribution of types 3 and 4.

2. Who would prevent the most Republican turnout (vs. not voting if the nominee were different?) The answer depends on the distribution of types 5 and 6.

3. Who would cause the most Democratic swing votes (vs. votes that would go Republican if the nominee were different)? The answer depends on the distribution of types 7 and 8.

The decomposition of the effect allows the definition to be linked with existing political science literature. For example, Hall and Thompson suggest that the tendency of an extremist nominee to galvanize the opposing party's base may be more electorally consequential than the nominee's ability to turn out the base of their own party [17]. Expressed in terms of the distribution of response types, and supposing Sanders were the nominee in question, that claim says that $(p_5 - p_6) > (p_3 - p_4)$. The definition also shows that people involved in the third question (types 7 and 8) are twice as important, electorally. This follows intuition: if a swing voter votes Democrat, then they, by definition, subtract a Republican vote, and vice versa. This theoretical result confirms what political strategists seemingly know to be true: that targeting the elusive "Obama-Trump" [20] voter is electorally important.

The framework can also be useful for assessing strategic arguments regarding which person a party should nominate. As an example, suppose during campaign season, a columnist asserted that if Biden were the nominee, Democratic turnout would be lower than if Sanders were nominated ($p_4 < p_3$), but that turnout among Republicans would also be lower ($p_6 < p_5$), and that, on net, a greater proportion of swing voters would vote Democrat ($p_8 > p_7$). A clear definition of the causal effect makes it easier to jointly weigh these inequalities when assessing the claims. A reader could even posit plausible values for each difference, applying the appropriate weight to the third one.

A few caveats and nuances warrant further comment. First, we defined the causal effect of the nominee on the popular vote. The definition can be extended to the Electoral College by applying the definition at the state level and summing the result on electoral votes over states and the District of Columbia.

Second, we stated above that the distribution of "doomed" and "immune" types (1, 2, and 9) does not impact the election result. This conclusion does not necessarily imply that these people cannot impact the election result by affecting the behavior of others. They can. For example, a committed Democrat could persuade someone who staunchly voted Republican in previous elections to vote Democrat in this one if Biden were the nominee. That is, a type-1 person can convert someone who was type 2 before to be type 8 now. This follows because a person's type is defined by contrasting counterfactual general-election voting behavior at the time of voting. Anything occurring before the moment the ballot is cast, including being persuaded by another person after the nomination, may affect that behavior. Assuming counterfactual consistency [21], intervoter effects given a certain candidate is nominated are captured by the distribution of types.

As a technical note, such intervoter effects raise the possibility of a violation of the Stable Unit Treatment Value Assumption (SUTVA) [22], wherein the exposure of one individual affects the outcome of another [23]. A SUTVA violation is not an issue here; counterfactual outcomes are still well defined because exposures (the nominees) are the same for all voters and therefore specified for all in the population [24].

Third, the definition assumes that the way a candidate wins the nomination (was it a landslide or a contested convention?) does not affect the distribution of response types. If the mode of victory were of interest, the response types could be further specified [25].

Finally, we defined the effect for two Democratic candidates, but it could be extended to more than two from the same party or multiple candidates from multiple parties. If three Democratic candidates were considered, there would be $3^3 = 27$ response types. The number of outcome possibilities is the same: in the general election, a person either votes Republican, Democrat, or not at all. The number of exposure levels changes as more candidates are considered. Suppose the primary for both parties were competitive and down to two finalists. There would be four exposure levels: (1) Democrat 1 vs. Republican 1, (2) Democrat 1 vs. Republican 2, (3) Democrat 2 vs. Republican 1, and (4) Democrat 2 vs. Republican 2. And the number of response types would be $3^4 = 81$. When multiple exposures are considered, the response-type framework may be useful for understanding interaction or effect modification [26], like how the effect of a certain Democratic nominee could differ depending on which Republican were nominated.

To conclude, the definition illustrates the utility of using counterfactual response types to define causal effects. In this example, the effect was defined by considering nine response types. The use of counterfactual thinking to frame electoral questions is certainly not new. Counterfactual models are used throughout the social sciences [10,11,27], including to study election outcomes [13–17]. Still, to our knowledge, the counterfactual-response-type version [9] (for lack of better terminology) has not been used to define causal effects in research on electability. We hope our contribution might help foster interdisciplinary communication [28] and reinforce the notion that methods and definitions can be common across disciplines even if substantive expertise may vary.

Acknowledgments

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Table 1

Nine types of people according to whom they would vote for in the U.S. general presidential election based on the Democratic nominee

Type	Proportion	Response type	Description
1	p_1	Committed Democrat	Will vote Democrat regardless of the nominee. That is, they are "doomed" to vote Democrat [9].
2	p_2	Committed Republican	Will vote Republican regardless of the Democratic nominee. They are "doomed" to vote Republican [9].
3	p_3	Sanders causes Democratic turnout	If Sanders is the nominee, will vote Democrat. Otherwise, will not vote.
4	p_4	Biden causes Democratic turnout	If Biden is the nominee, will vote Democrat. Otherwise, will not vote.
5	p_5	Sanders causes Republican turnout	If Sanders is the nominee, will vote Republican. Otherwise, will not vote.
6	p_6	Biden causes Republican turnout	If Biden is the nominee, will vote Republican. Otherwise, will not vote.
7	p_7	Sanders swing voter	If Sanders is the nominee, will vote Democrat. Otherwise, will vote for Trump.
8	p_8	Biden swing voter	If Biden is the nominee, will vote Democrat. Otherwise, will vote for Trump.
9	p_9	Committed nonvoter	Will not vote regardless of the Democratic nominee. Forcing the analogy, they are "immune" [9] to voting.

Table 2

Interpreting components of the causal effect

Difference	Interpretation
$p_3 - p_4$	If greater than zero, Sanders would cause more people to turn out to vote Democrat (vs. not voting) than Biden would. If less than zero, Biden would cause a greater Democratic turnout than Sanders.
$p_6 - p_5$	If greater than zero, Biden would cause more people to turn out to vote Republican (vs. not voting) than Sanders would. If less than zero, Sanders would cause a greater Republican turnout than Biden.
$2 \times (p_7 - p_8)$	If greater than zero, Sanders would swing more votes from Republican to Democrat than Biden would. If less than zero, Biden would swing more votes from Republican to Democrat than Sanders. Note, this difference has twice the weight as the other two.