SMOKELESS TOBACCO AND CIGARETTES: GATEWAYS, CAUSAL PATHWAYS, AND HARM REDUCTION

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There are currently widespread efforts by government and advocacy organizations to dissuade people from using smokeless tobacco (ST).

And yet, ST does not create a large risk of life-threatening disease.

The evidence shows that *even worst case*, ST is:

- safer than transport,
- safer than sex,
- safer than many popular pharmaceuticals,
- much less risky than poor diet/exercise patterns.

-it is clearly much safer than cigarettes.

That is the important comparison, since the use of the two products is clearly related.

(can set aside question of exactly how much safer and even if there is any excess mortality risk at all from modern products)

ST use is correlated with smoking and might, for some people, change the likelihood of smoking in the future.

If ST use did not have potential to change smoking behavior
then dissuading people from using it would have very little health effect one way or the other.

However, it does have the potential to change smoking behavior.

ST might be used as a substitute for cigarettes ("**harm reduction**")

If so, dissuading people from using ST (especially by convincing them that it is just as unhealthy as cigarettes) has potentially large health costs, because it prevents harm reduction.

On the other hand, ST use might cause some people to later use cigarettes ("**gateway")**.

Since ST is not very risky in itself, the possibility of a gateway effect is the only apparent justification for making large efforts to dissuade adults from using ST.

Attempts to dissuade adults from using ST must be justified, because they will have negative health consequences:

1. They undermine the harm reduction message.

2. They tend to make ST users more likely to take up smoking.

3. Making the effort consumes resources that could be devoted to other health-improving messages (and threaten to undermine credibility).

4. Consumers have limited willingness to listen to health messages, so this message will diminish the effectiveness of other messages (especially if they lead to a lack of credibility).

So how sure are we that there really is a gateway effect?

There are widespread claims in the scientific literature and popular information about ST.

Several published articles claims to demonstrate it.

(Note that the term "gateway" is not used universally. Equivalent claims sometimes use other jargon, including "risk factor" or "starter product".)

But there is really no compelling evidence that there is a substantial gateway effect.

Moreover, even if there is currently a gateway effect, it would not necessarily persist is people knew the true risks.

Gateway, definition

Seldom precisely defined when used.

For the term to have any consequence, it must refer to something that causes harm. Thus, the implicit definition is:

"ST use *causes* people to smoke later"

Gateway, definition, cont.

Common confusion about what constitutes a gateway:

We really care about a causal relationship.

This is not the same as,

"a behavior that often precedes the second"
(orange juice drinking is a gateway to smoking)

or even,

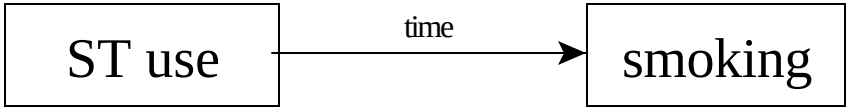
"a behavior that is positively correlated with the probability of the second"
(attending school is a gateway to smoking)

Counterfactual (i.e., causal) definition of a gateway

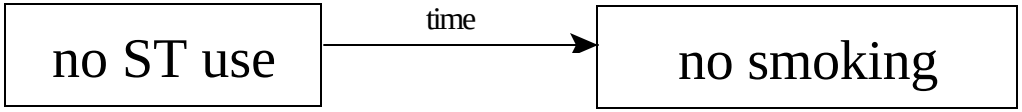
Causality (which is what we really care about) involves a counterfactual statement (cannot directly observe).

A gateway effect exists if there are a nontrivial number of people whose tobacco use over time is characterized by:

if in World A: with ST (is freely available, advertised, popular, etc.)



but if in World B: without ST (is unpopular, restricted, banned)

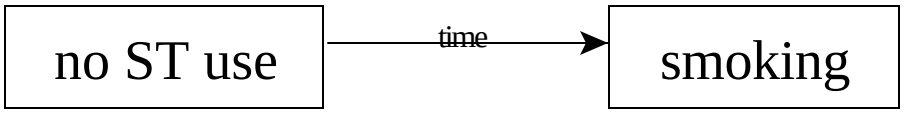


Counterfactual definition of gateway, cont.

Notice that someone having a temporal pattern of:

is not sufficient to conclude there is a gateway effect,

because, for example, in World B the pattern would have been:



There is no causal relationship.

(Also the pattern is not necessary. Someone who smoked first might still have been caused to continue smoking by using ST.)

Typical results that are claimed to support gateway hypothesis

Tomar, *Nicotine & Tobacco Research*, 2003

11-19-year-olds at baseline, 4 year followup

result: Baseline ST users 3x as likely to initiate smoking as non-ST-users.

Peterson, Marek, and Mann, *NCI Monographs*, 1989

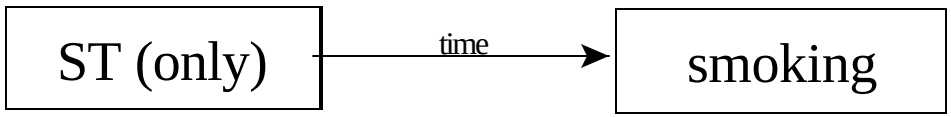
tenth graders, retrospective

result: Those who have used ST roughly 2x as likely to initiate smoking.

Typical results that are claimed to support gateway hypothesis, cont.

Both of these base their claims on observing that,

in World A (the real world we observe), there are a disproportionate number of subjects characterized by:

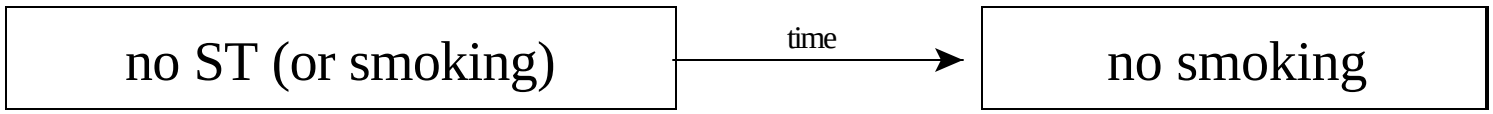


(disproportionate = more than average rate of smoking initiation)

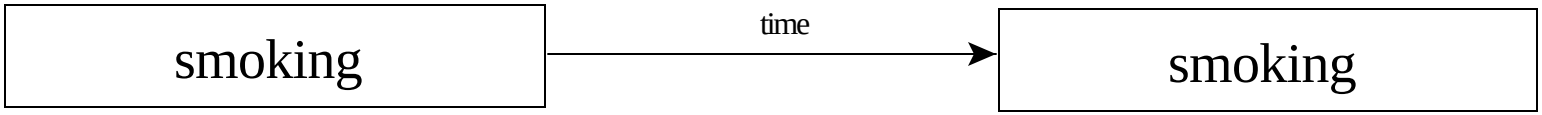
Typical results that are claimed to support gateway hypothesis, cont.

But this observation is consistent with someone in World B (the counterfactual),

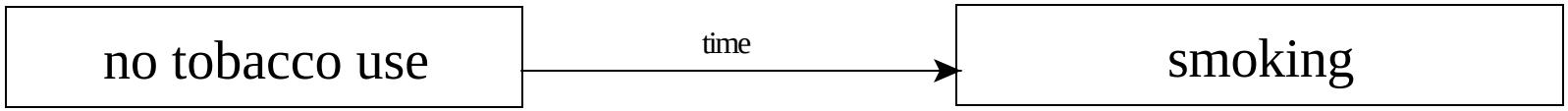
for whom ST indeed caused causing smoking (gateway):



or ST temporarily substituted for smoking (not gateway):



or smoking initiation would have occurred anyway (not gateway):



Causal diagrams

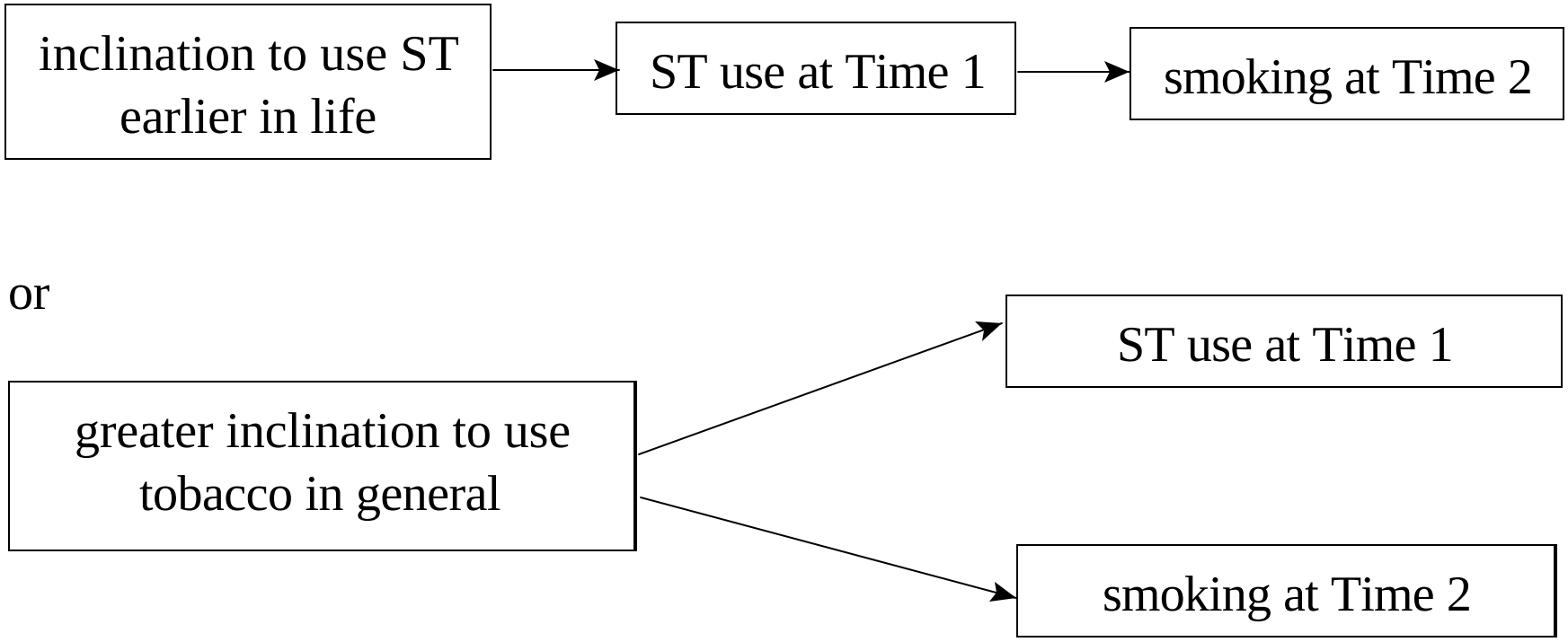
Thus, merely modeling temporal patterns is not useful.

We need models of actual causation.

An increasingly popular method for this is directional acyclic graphs, DAGs (a complicated way of saying "diagrams with arrows that show causal relationships among people's characteristics")

Using such diagrams, we can illustrate two explanations for why the average rate of smoking initiation is higher among ST users.

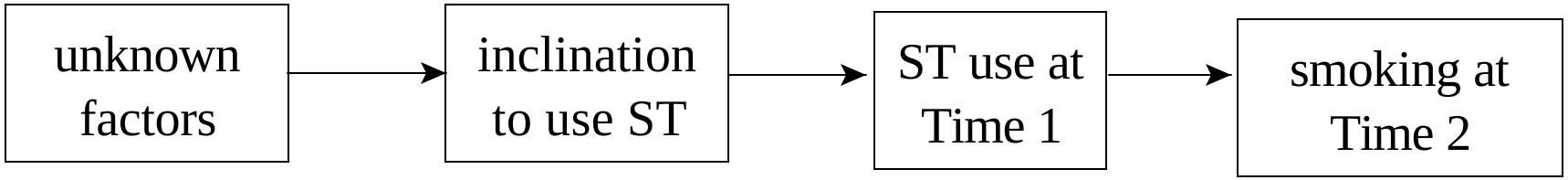
Models of Causation (arrow indicate causal influence on probability)



Each of these diagrams is consistent will all the findings that claim to support a gateway effect (but only the first is a gateway effect).

When designing policy, it makes a very big difference how many people are described by each of these diagrams.

Expanding the two models a bit, we get the following:



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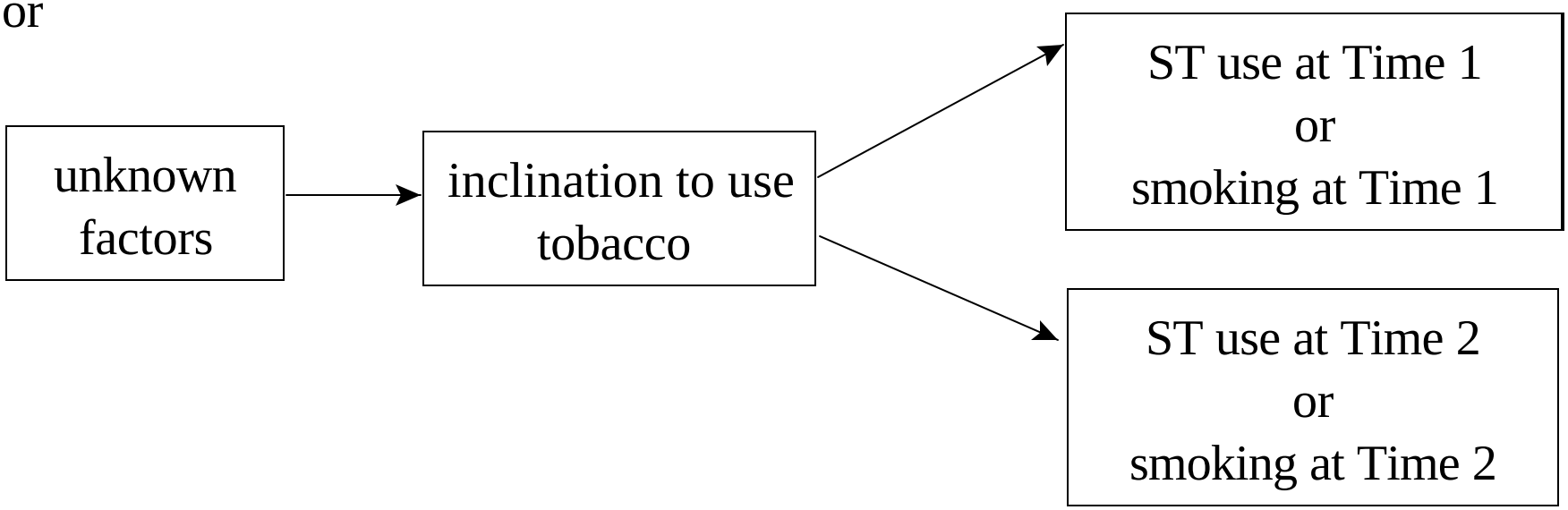
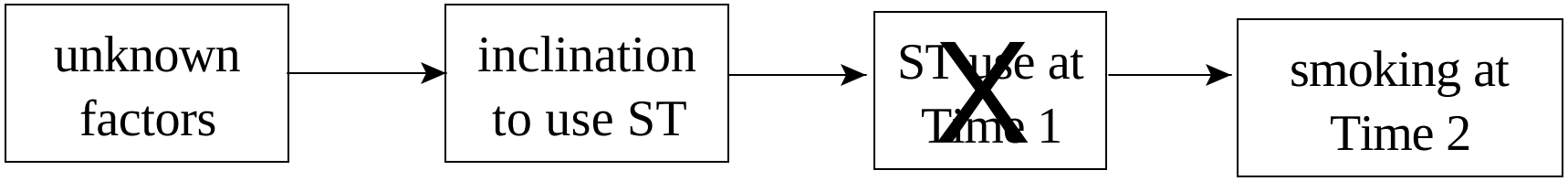


In the gateway model, if we can reduce inclination to use ST or make ST unavailable...



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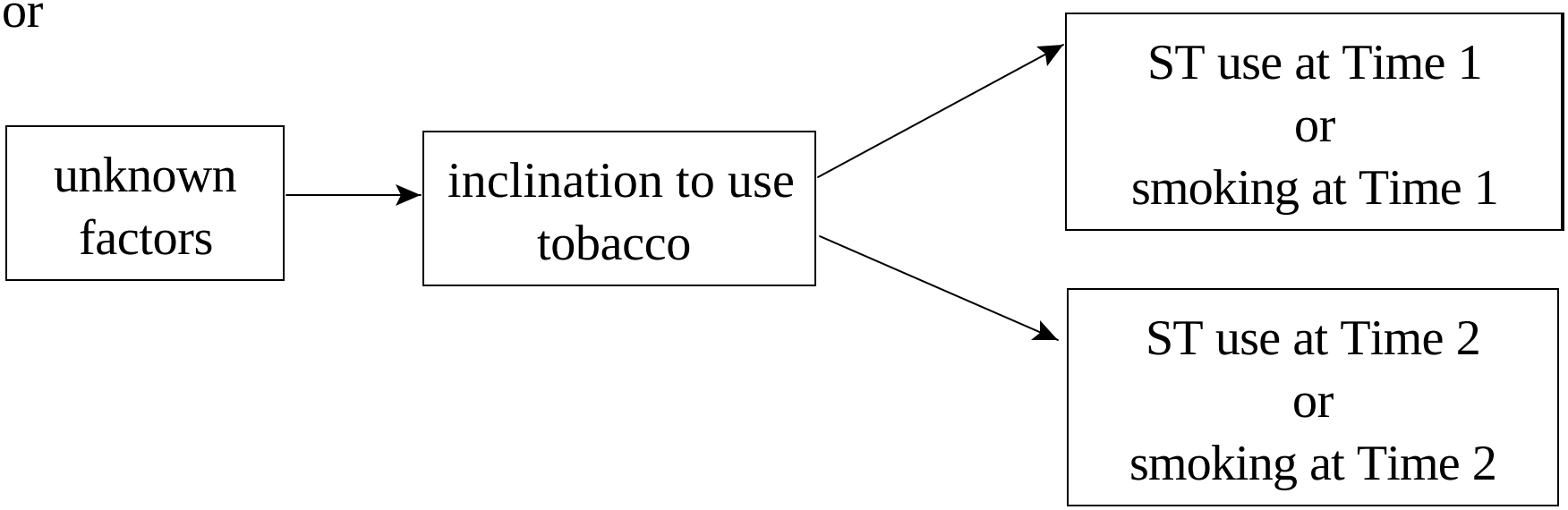
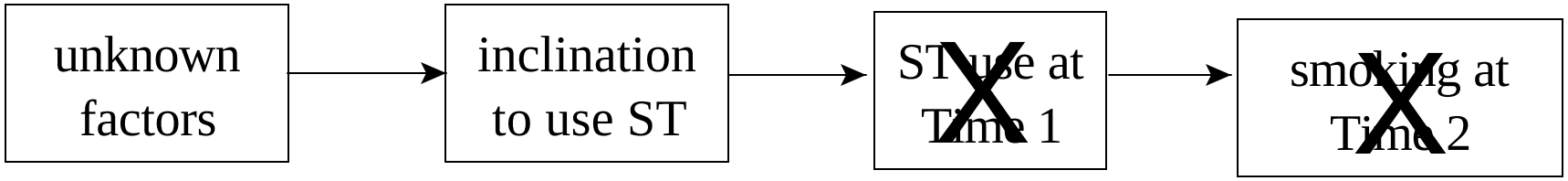


...then the increased risk of smoking initiation is eliminated.



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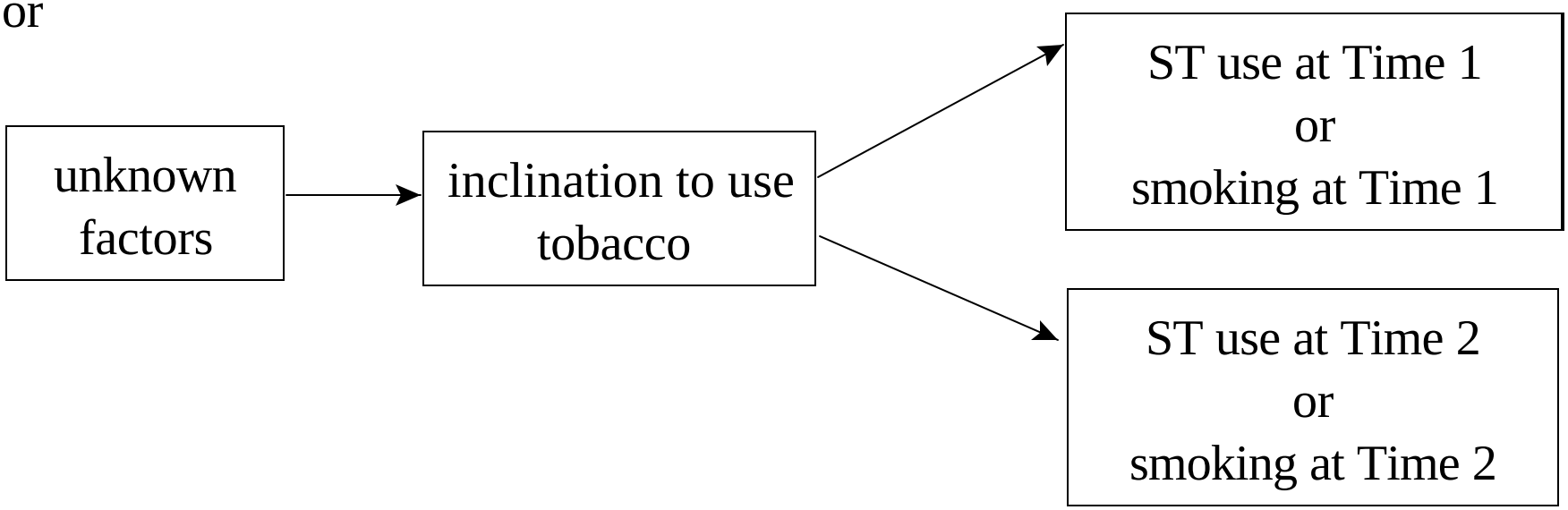
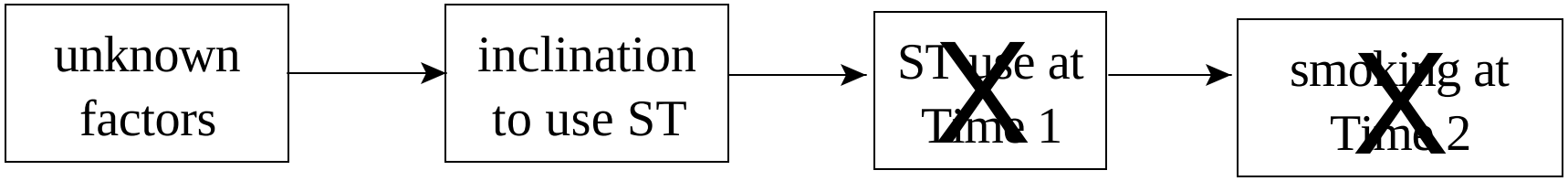


But in the common inclination model, if we make ST less popular, then more people take up smoking.



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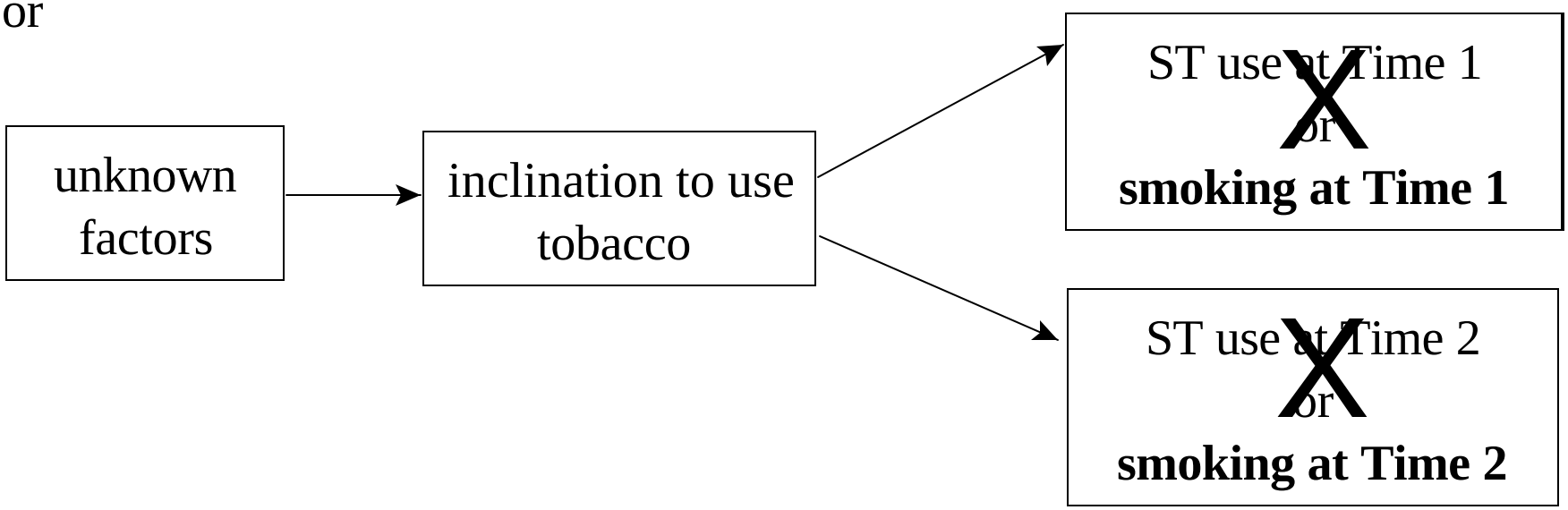

The data that shows ST users are more likely to become smokers than non-ST users is therefore consistent with either of these conclusions:

Efforts to make ST less popular, less available, or more expensive will *prevent* premature mortality (by reducing smoking).

or

Efforts to make ST less popular, less available, or more expensive will *cause* premature mortality (by increasing smoking).

(Direct health effects of ST are inconsequential compared to these effects.)

Which story fits the data better?

The smoking and/or ST use is associated with other behaviors

e.g., Haddock et al. *Preventive Medicine*, 2001
U.S. Air Force recruits, cohort

result: Those who used ST before enlisting roughly twice as likely to initiate smoking (purported to show gateway effect).

also: ST users and smokers both more likely to drive fast, binge drink, not use seatbelts, eat badly

So, it appears that there is some underlying trait that leads to ST use, smoking, and other risky behaviors.

Making ST unavailable will not alter that trait.

People switch in each direction

e.g., Tomar, *American Journal of Preventive Medicine*, 2002
adult males, retrospective (NHIS)

results: higher prevalence of smoking among ex-ST users compared to never-users, and higher prevalence of ex-smokers among ST users

In general, users of one product are disproportionately ex-users of the other. Ex-users of one product are disproportionately current users of the other.

I have found this patter in other data too (unpublished)), and it is what we all probably would have guessed.

This seems like better support for the common inclination hypothesis than for the gateway hypothesis.

The *really* disturbing result of these studies and observations is simply:

Many people switch from ST to smoking.

Whether they would have smoked anyway in a world without ST or it was a gateway, this switch is a bad thing.

Why would people switch from one product to a similar product that is *much* less healthy?

Most likely because they do not know it is much less healthy. They are repeatedly told that ST is not better for you than smoking.

I submit that overstating the risks of ST is a gateway to smoking.

Conclusions

Existing evidence does not demonstrate (or deny) that there is currently a substantial gateway effect.

Research could be better designed to actually test this hypothesis.

But who cares?

Why would knowing change our policy decisions?

If ST and smoking stem from a common cause, we can encourage the use of the safer product.

If there really is a substantial gateway effect, letting ST users know that switching to cigarettes is dramatically less healthy seems like the obvious way to close that gate.

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