Twitter Thread by Arielle Selya

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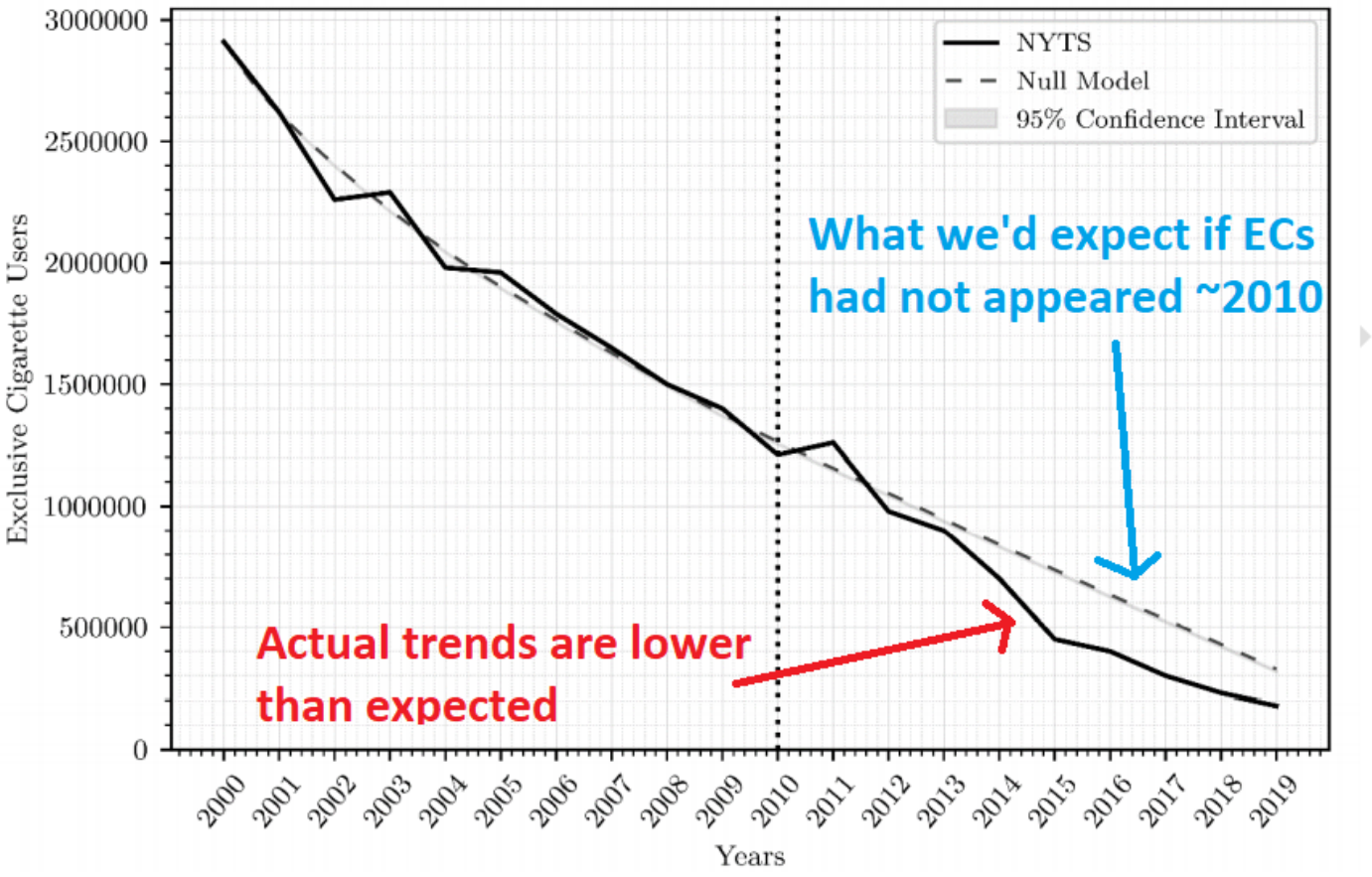
1/14 How do e-cigarettes (ECs) affect cigarette smoking among youth? My new paper with @FloeFoxon simulates each scenario and finds out which one best matches actual trends... https://t.co/dBB7kcnTls @jgitchell @mikepesko @SwitchFinder @jkelovuori @TobPolicy @Clive_Bates

2/14 First, let's talk about why this question is so difficult to answer: COUNTERFACTUALS. We can't know the alternate-reality answers, like which smokers would have never started in a world without ECs, and which nonsmokers would now be smoking without ECs as an option.

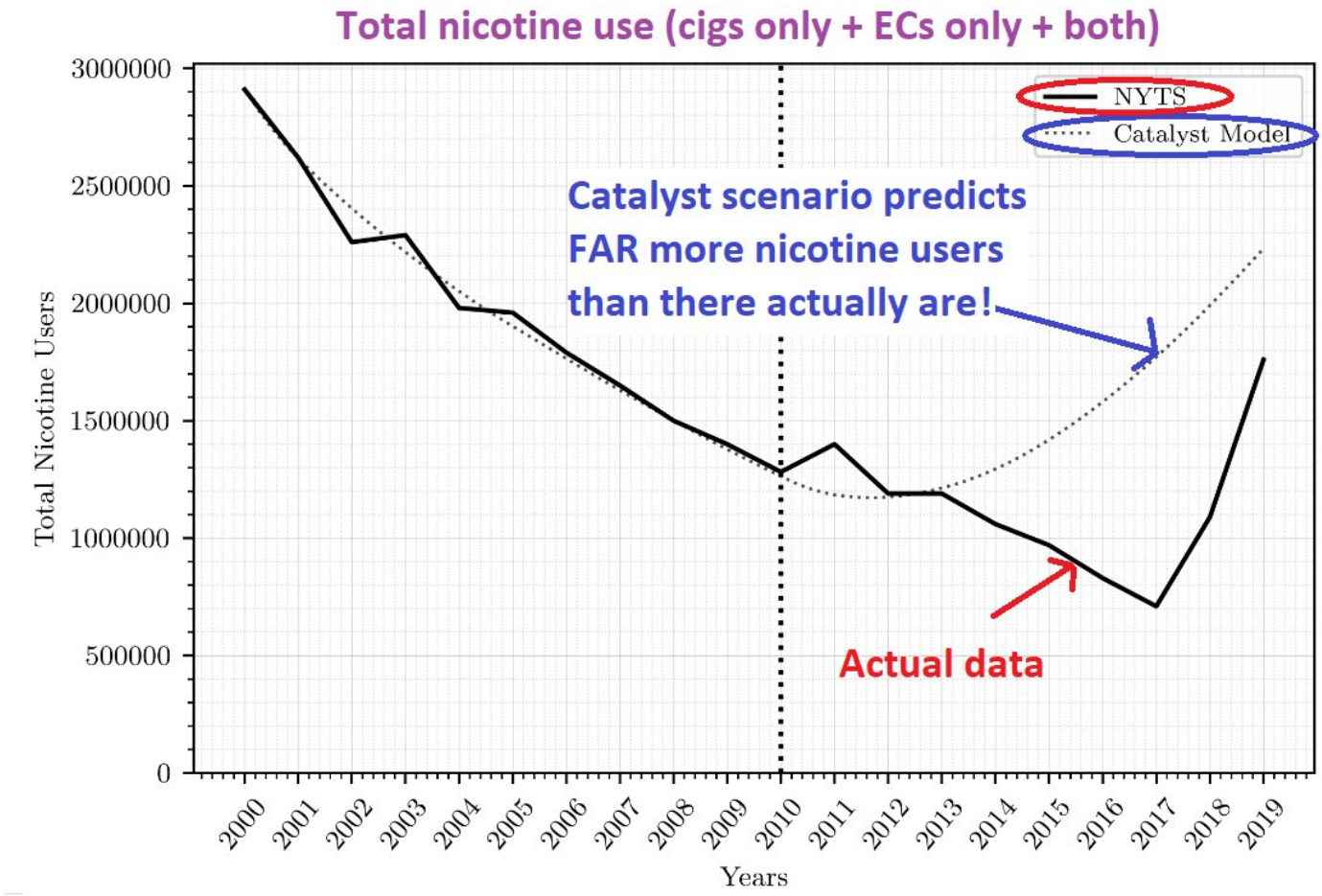
3/14 So, the best we can do is use fancy/sophisticated methodologies to estimate what would have happened to youth smoking rates in the absence of ECs. In our case, simulation modeling

4/14 First, we look at the declining smoking trends *that were already happening* before ECs came (~2010), and project them into the present. This is our BASE-CASE SCENARIO about what smoking trends would be if ECs were never invented. Actual trends were LOWER than this base-case



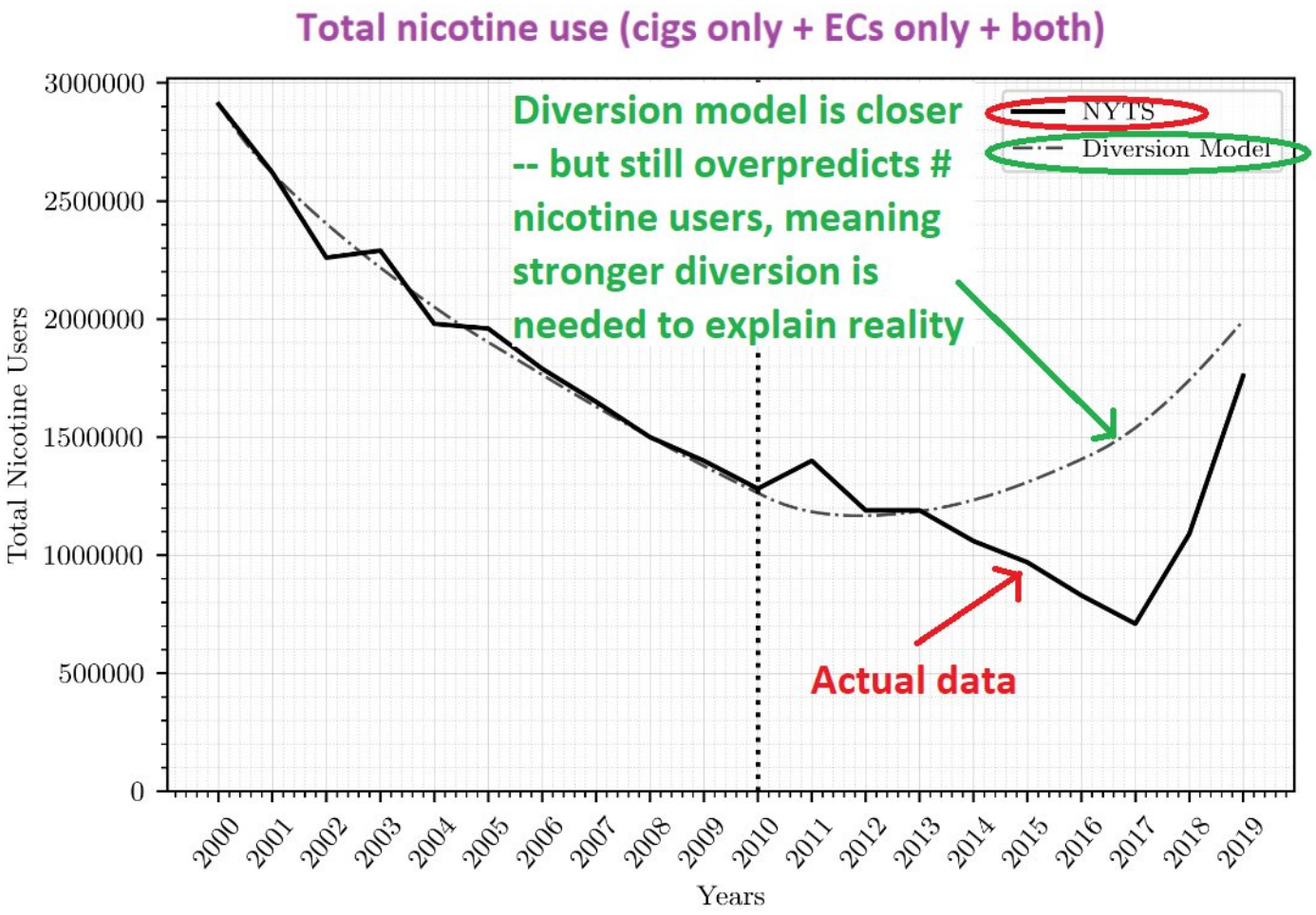
5/14 Side note about terminology: We use the term “catalyst” instead of “gateway,” because “catalyst” is more precise about the claim we are modeling (that ECs are used first, and then causally lead to smoking). Whereas "gateway" can include other mechanisms like renormalization.

6/14 Starting from the base-case scenario, we "switch on" a catalyst effect, where EC users also start smoking. We assume a worst-case scenario, where ALL dual users have gotten there because of a catalyst effect -- this FURTHER overpredicts actual trends.

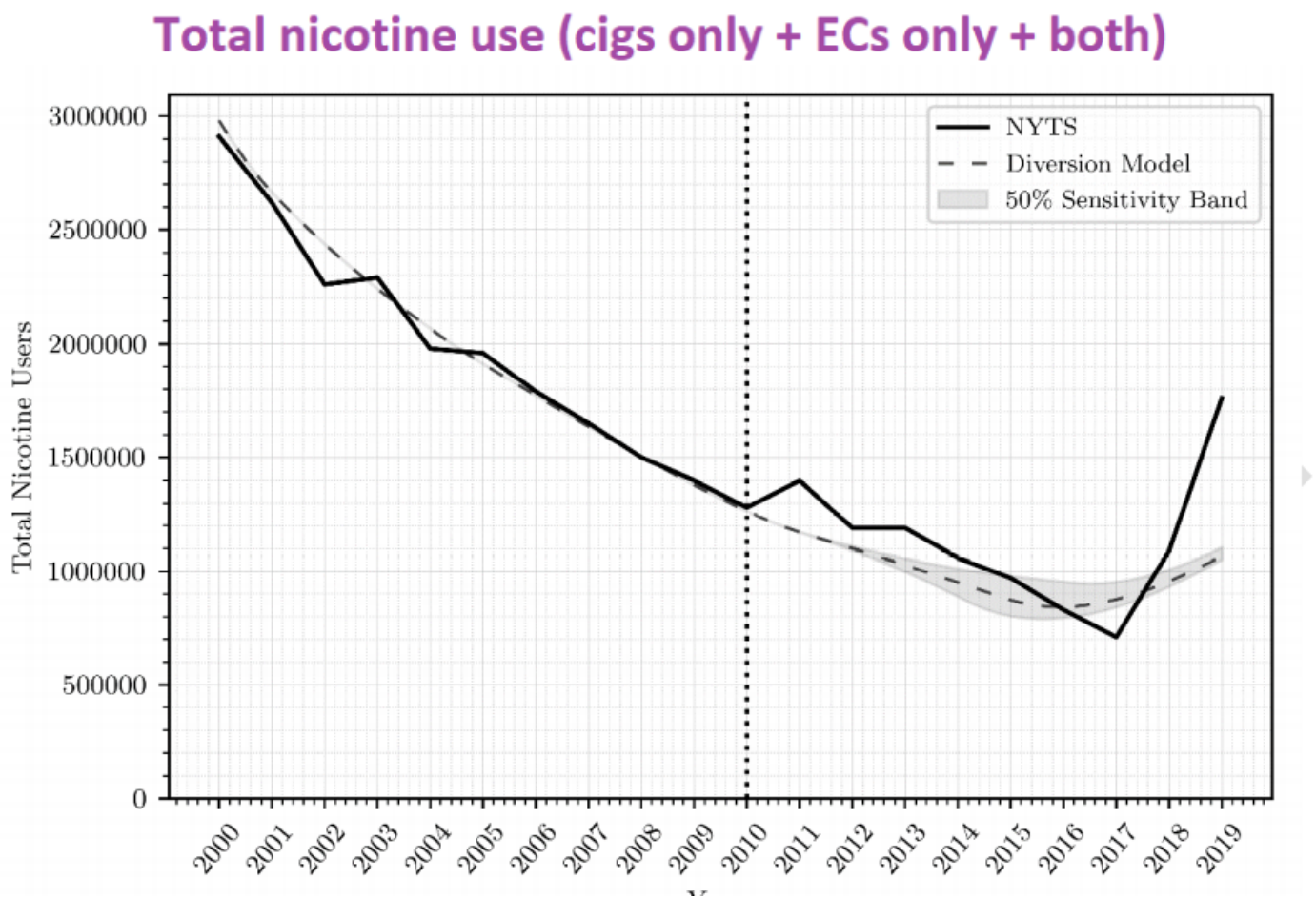


7/14 So... gateway doesn't fit reality (at the population level)

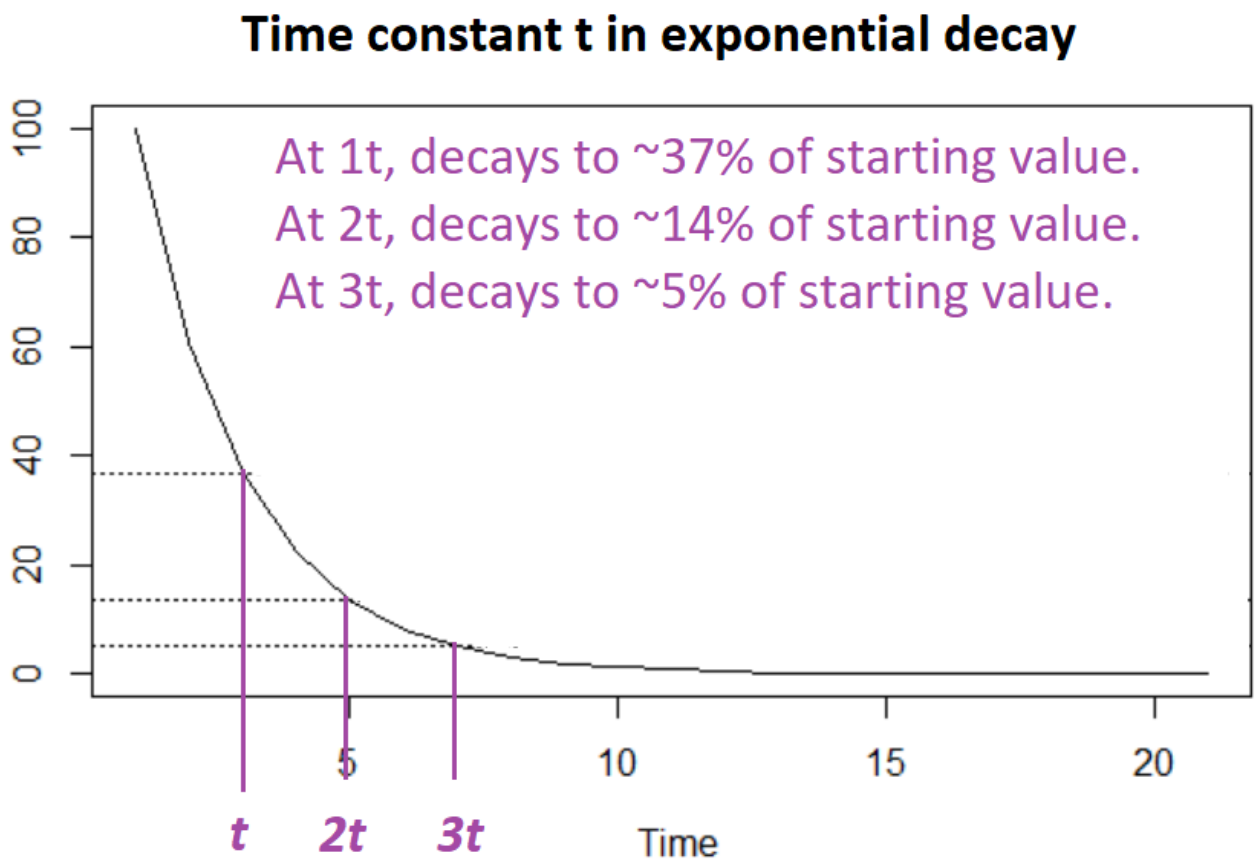
8/14 Then, starting again from the base-case scenario, we "switch on" a diversion effect, where EC users are prevented from ever becoming smokers. This is closer to the actual trends, but still overpredicts -- meaning a stronger diversion effect is needed to explain reality!



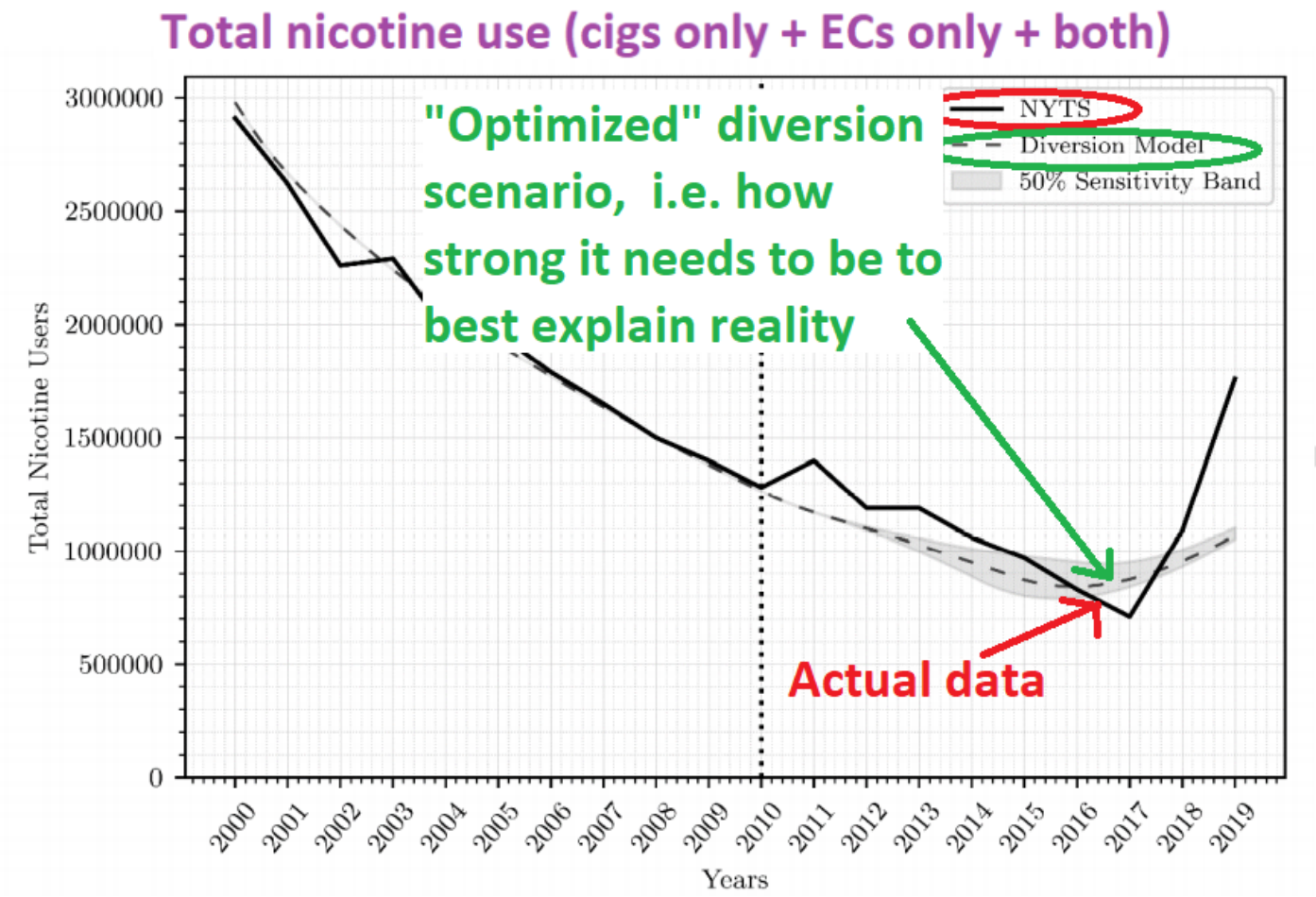
9/14 So, we optimized the simulation model to find *how large a diversion effect would have to be*, to match real-world trends: exponential decay constant of 55.4% of EC users/year are prevented from ever smoking!



10/14 What's an exponential decay constant? It's related to the concept of half-life. # of EC users is assumed to decay exponentially if left alone – a standard modeling assumption. 55.4% describes how fast this decline occurs – higher means more EC users prevented from smoking.



11/14 Finally, we "switched on" both effects -- figuring that ECs may act as a catalyst for some, and a diversion for others. Even in the presence of an opposing catalyst effect, *a net diversion effect is necessary* to explain actual trends (of 65.4% EC users/year).



12/14 All together, real data are MUCH more consistent with a diversion effect (and a rather strong one at that!), than a null effect or catalyst/gateway effect.

13/14 Caveats: This doesn't conclusively prove a diversion effect, but it does show that population-level trends are much better explained by a *net* diversion effect, and are wildly inconsistent with a net catalyst effect. https://t.co/pTYbsCl1hd

14/14 Disclosures: I now work for PinneyAssociates, which consults for JUUL Labs on tobacco harm reduction. However, this study was completed and submitted BEFORE these activities began, in a purely academic position. In fact, my line of research is why I joined Pinney!