

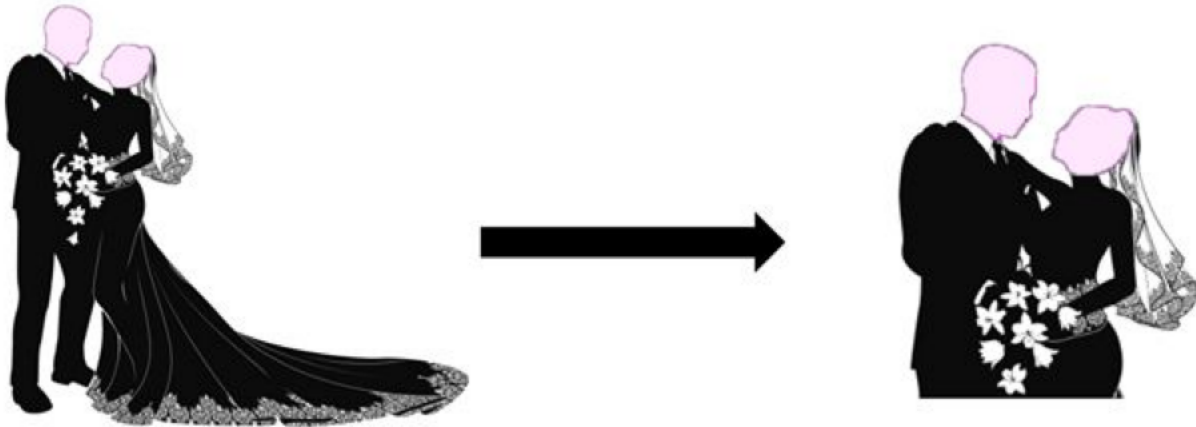
AsPredicted registration:

1. Have any data been collected for this study already? (optional)

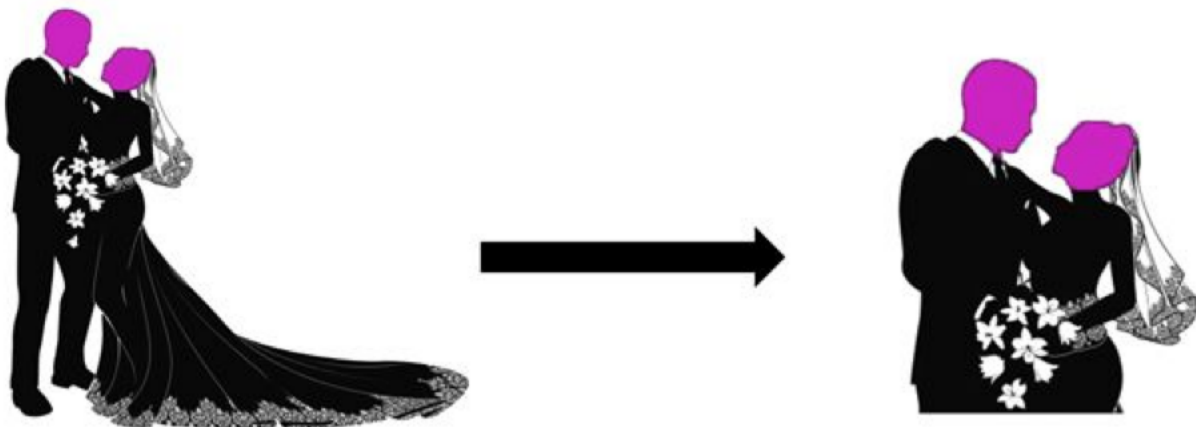
Yes – we have run an initial pilot round of this study, using the same images and a completely identical approach, but at a smaller scale.

2. What's the main question being asked or hypothesis being tested in this study? (optional)

We will conduct a 2 x 2 experiment to test the role of racial bias in whether Instagram users like advertisements for wedding pictures. We test whether images of people with dark complexions receive less favorable engagement, relative to a baseline, when the advertisement zooms in:



Picture 1, Zoomed Out and Zoomed In



Picture 2, Zoomed Out and Zoomed In

Consider two photographs like the ones above that are highly similar but differ in the skin complexion of the people being pictured. The hypothesis is: if an Instagram ad zooms in on both pictures, in a way that makes the skin of the models take up more of the image, does this lead to racial disparities? Specifically, let  $P_L$  be equal to the Number of Likes for a photograph of a model with a lighter complexion divided by the Total Number of People Who Viewed that photograph,  $P_D$  be the same for a photograph of a model with a dark complexion,  $P_{LZ}$  be the same for the zoomed-in photograph of the model with a light complexion, and  $P_{DZ}$  be the same for a zoomed-in photograph of the model with a dark complexion.

Is  $P_{LZ} - P_L > P_{DZ} - P_D$ ?

3. Describe the key dependent variable(s) specifying how they will be measured. (optional)

The key dependent variables –  $P_{LZ}$ ,  $P_L$ ,  $P_{DZ}$ , and  $P_D$  – will be measured as the number of likes left for each photograph divided by the number of “reaches”, which Instagram defines as the number of people who saw the photograph in their Instagram feed.

4. How many and which conditions will participants be assigned to? (optional)

For the likes experiment, users are assigned to one of four conditions:

- A zoomed-out wedding photograph with people with light complexions
- A zoomed-out wedding photograph with people with dark complexions
- A zoomed-in wedding photograph with people with light complexions
- A zoomed-in wedding photograph with people with dark complexions

The specific photographs to be tested are below. Of note, there are three approaches to finding pairs of photographs that are similar to each other but have models of different skin complexion:

- 1) We could find pictures that look highly similar – same pose, same theme – but where the models photographed have different skin complexions
- 2) We could take a picture of someone with a light complexion and darken it using photo editing software
- 3) We could take a picture of someone with a dark complexion and lighten it using photo editing software

We use all three approaches, and we use each approach two times.



		Pair 1		Pair 2	
Pigmentation modification	Group	Black, uncropped	White, uncropped	Black, cropped	White, cropped
Dark skin artificially lightened	1 (Torso)				
	2 (Keyhole dress)				
Light skin artificially darkened	3 (Holding flowers)				
	4 (V-back dress)				
No artificial lightening or darkening	5 (Holding hands)				
	6 (Racerback dress)				



5. Specify exactly which analyses you will conduct to examine the main question/hypothesis. (optional)

We will conduct a T-test for difference in proportions to measure:

Do racial disparities in the zoomed-out photographs of people with dark vs light complexions get exacerbated in the zoomed-in photographs?

That is, does the following expression hold?

$$P_{LZ} - P_L > P_{DZ} - P_D$$

6. Any secondary analyses? (optional)

For our measure of potential racial disparity (  $[P_{LZ} - P_L] - [P_{DZ} - P_D]$  ), we will have geographic breakdowns at the state level.

We will calculate the geographic correlation at the state level of this measure of racial disparity with two other measures of racial disparities: the IAT self-survey of racial attitudes, and the measure of racial resentment in the ANES survey, and black maternal mortality per 1,000,000 minus white maternal mortality.

Our hypothesis is that our measure of racial disparity will be positively correlated with these measures.

7. How many observations will be collected or what will determine the sample size? No need to justify decision, but be precise about exactly how the number will be determined. (optional)

We will collect roughly 75,000 observations.

In pilot studies, we found values as follows:

	Proportion
P_LZ	0.308
P_L	0.184
P_DZ	0.241
P_D	0.183

We therefore aim for a sample size large enough to distinguish these differences for each pair of photos. Specifically, if  $P_{LZ} - P_L = 0.12$ , and  $P_{DZ} - P_D = 0.06$ , we want a sample size large enough to distinguish these two differences in proportions.

The standard error for a difference in the difference of proportions =  $\sqrt{(\text{std error of prop}_1)^2 + (\text{std error of prop}_2)^2 + (\text{std error of prop}_3)^2 + (\text{std error of prop}_4)^2}$ . Here, if  $N = 3200$  for each of  $P_{LZ}$ ,  $P_L$ ,  $P_{DZ}$ , and  $P_D$ , then that leads to a standard error of roughly 0.01, which would be enough to reject the null hypothesis for each pair of pictures. We would be well



over-powered to test our main hypothesis across all pairs of pictures. And the extra power would help us see differences in outcomes across states.

500 observations for each photo in the experiment leads to  $(500 \text{ observations}) * (6 \text{ sets of pictures}) * (4 \text{ pictures}) = 12000 \text{ total observations}$ .

8. Anything else you would like to pre-register? (e.g., data exclusions, variables collected for exploratory purposes, unusual analyses planned?) (optional)

Instagram requires users to select targeting settings for advertisements. For this experiment, we target people aged 18 to 65+ (65+ is the oldest age setting possible), living in the United States, with an interest in wedding photography. The campaign objective is "Post engagement" and the ad placement setting is "Instagram feed." For more details on these settings, please go to Facebook's [online ad resources](#).

If we find evidence of race discrimination in the United States, we may re-run the experiment in geographies where the majority of Instagram users are likely to have dark complexions, such as Lagos, Nigeria; Kingston, Jamaica; Nassau, Bahamas.



