Did Negative News Regarding the Oxford AstraZeneca Vaccine end in Vaccine Hesitancy? A Repeated Cross-Section Event Study from the UK

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Abstract

Vaccine hesitancy is influenced by perceived risk and benefits. On March 15th 2021 various countries suspended use of the Oxford AstraZeneca vaccine against Covid-19 following deaths arising from blood clots. The story became headline news and online search querying vaccine safety increased. What happened to Covid-19 vaccine intentions? We were collecting relevant data at the time. Our survey asked UK adults if they intended to get the vaccine and measured their attitudes towards it. Data collection from respondents before coverage of the story reached its peak (March 12th-15th; $n = 241$) was compared with responses after the peak (March 17th; $n = 305$). Our data show no reductions in intentions or attitudes. Our study is uniquely positioned to analyse real-world responses and indicates that media coverage of this story did not reduce intention to take up the vaccine in the UK.

Keywords: Vaccine hesitancy, risk perception, belief updating, naturalistic, event study

Clinical trials have demonstrated that many of the vaccines developed against Covid-19 are effective[1,2]. Their efficacy is necessarily limited if people refuse to receive them. A recent survey experiment on a representative sample of the UK population found that exposure to negative misinformation about a Covid-19 vaccine reduced intention to vaccinate by 6.2 percentage points[3]. This finding suggests cause for concern for two reasons. First, herd immunity can only be achieved if uptake of the vaccine is high; it has been estimated that 65.5 percent of the UK population would need to be vaccinated if the pandemic is to be contained[4]. Second, the UK public has been exposed to a highly publicised negative news story regarding its most-widely used vaccine[5], that produced by AstraZeneca (henceforth the AZ vaccine). On the evening of March 15th a lead story on radio[6] and television news[7]

reported that France, Germany, Italy and some other European countries had suspended use of the AZ vaccine following deaths arising from blood clots. The following day, the story was front-page news on UK newspapers across the spectrum (Figure 1). Within days the European Medicine's Agency had pronounced that the AZ vaccine's benefits outweighed its risks and most countries resumed delivery of it[8]. Still, commentators from the science community and media alike have raised concerns about how this news might impact public trust in the vaccine[8,9].

The current research describes the effect of these events on intentions to take a vaccine against Covid-19 and on attitudes to vaccination against Covid-19. We happened to have collected data as the story was gathering pace, over the period Friday March 12th to the morning of Monday March 15th. We put our survey out again on the morning of Wednesday March 17th, immediately after the story had reached peak exposure.

The Blood Clot / Vaccine Suspension Story

On the evening of Monday, March 15th the lead story on the 6pm *Radio 4* News broadcast[5] and the 7pm *Channel 4* television news[6] was that various European countries, including France, Germany and Italy, had suspended use of the AZ vaccine. Channel 4 correspondent Victoria MacDonald reported that this was "because of these reports of blood clots and some deaths"[6.]

On Tuesday the story was the lead headline on British newspapers across the board, from the left-leaning *Guardian*[10] to the right-leaning *Telegraph*[10], from the populist *Daily Mail*[10] to the *Financial Times*[9] (Figure 1).

Figure 1: Screenshot of Front Page of the Daily Mail[6] (left) and Financial Times[7] (right) print editions from Tuesday March 16th.

Table 1: Timeline of Events

Day	Event	UK Media coverage	Data collection activity
Thursday 11	Iceland, Denmark and Norway suspend use of the AZ vaccine amid blood clot fears.[14]	None that we can find. Figure 2 also suggests the suspensions were not salient to the UK public.	
Friday 12		Online search activity on Thursday 11th is as it had	12.36pm: *Before* data

|			
		been on Wednesday 10th and it falls on Friday 12th.	collection starts
Saturday 13			
Sunday 14	10.13am - Irish Minister for Health tweets that Ireland will suspend use of AZ vaccine citing "new information from Norway that emerged late last night"[15] Netherlands suspends use of AZ vaccine on Sunday night.	1pm - BBC Radio 4 current affairs program "The World This Week" does not discuss the blood clot fears or the suspensions. The news bulletin that opens the program reports the Irish suspension and its link to the Norwegian blood clots as the fourth item[16].	
Monday 15 a.m.	The European Medicines Agency schedules an extraordinary meeting for Thursday to conclude on the safety of the AZ vaccine.[17]	7.30am - Immediately after the news bulletin on BBC Radio 4's Today program Prof. Andrew Pollard of the Oxford Vaccine Group was interviewed about the Irish and Dutch suspensions.[18]	9.11am: *Before* data collection stops
Monday 15 p.m.	By evening use of the AZ vaccine has been suspended in many European countries, including France, Germany and Italy.	The story becomes a lead headline e.g. BBC radio 4 6pm news[6]; Channel 4 television news at 7pm[7].	
Tuesday 16		The AZ story is frontpage news on most UK papers[10].	
Wednesday 17			10.56am: *After* data collection begins
Thursday 18	An extraordinary meeting of the European Medicines Agency pronounces that the benefits of the AZ vaccine outweigh risks[19].		
Friday 19	Many European countries restart use of the Vaccine.	Various UK newspapers run the EMA's pronouncement as their frontpage headline (e.g. "Jab is Safe" in Daily Mail, Daily Express and Daily Telegraph)[20]	

A widely-expressed concern in media reports was how this news would impact public confidence in vaccination against Covid-19. On Monday evening Prof. Adam Finn pointed out on BBC radio's primetime current affairs program, *PM*, that this was "doing reputational damage to the vaccine and to vaccines in general" [11]. In a subheading on page 4, the Financial Times asked "What Will This Mean for Public Confidence?"[12]. The Economist predicted that "doubts caused by a temporary halt are likely to persist"[8], a view echoed in an opinion piece published by the British Medical Journal[13].

The prominence given to the story in the media came suddenly on Monday afternoon though it is important to note that it had been brewing for several days. Table 1 presents a timeline of events ending on Friday March 19th with front-page headlines reporting the resumption of AZ use in many European countries.

A measure of the public concern around the safety of the vaccine is presented in Figure 2. It depicts Google Trends data for the month February 21st to March 21st within the UK for searches that include the terms "vaccine" and "safe". There is a clear uptick in search activity coincident with the events and media reporting described in Table 1. Search for the terms on the first day of our data collection, Friday 12th, is in line with the previous period and is 33% of the search activity on Monday March 15th, where it peaks. It remains high on Tuesday 16th, at 93% of the Monday's level. These data demonstrate that the blood clot/ AZ suspension story entered the public consciousness and caused sufficient concern to prompt the UK public to seek information online.

The question that this research seeks to answer is whether the public concern manifest in Figure 2 translated into vaccine hesitancy.

Figure 2. Google Trends Graph mapping searches including the words "vaccine" and "safe" originating within the UK in the period February 21st to March 21st
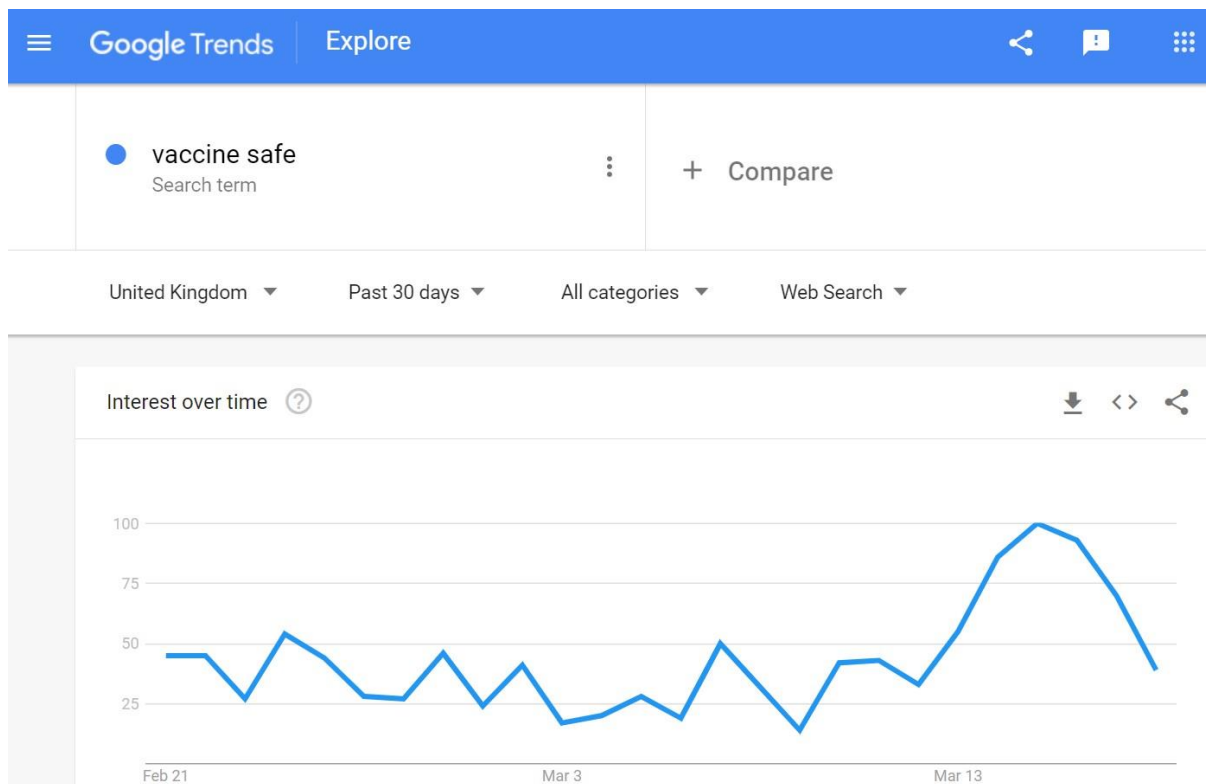
Note: We use this search term because it encompasses various more specific formulations e.g. "is the Covid vaccine safe?" and "is the Oxford AstraZeneca vaccine safe?"

Results

Table 2 describes the characteristics of our *before* and *after* samples. The sample of core interest to our study is those respondents who have not yet been vaccinated because this is the group who answered our intention to vaccinate question. The first row of Table 1 shows that there is no significant difference in the likelihood of being vaccinated between our *before* and *after* samples. The rows that follow restrict the sample to those who have not been vaccinated and so answered the intentions question ($n = 433$). There are no differences in the observable characteristics of the two groups. This is not surprising since both samples were recruited in precisely the same way (via Prolific.co[21]).
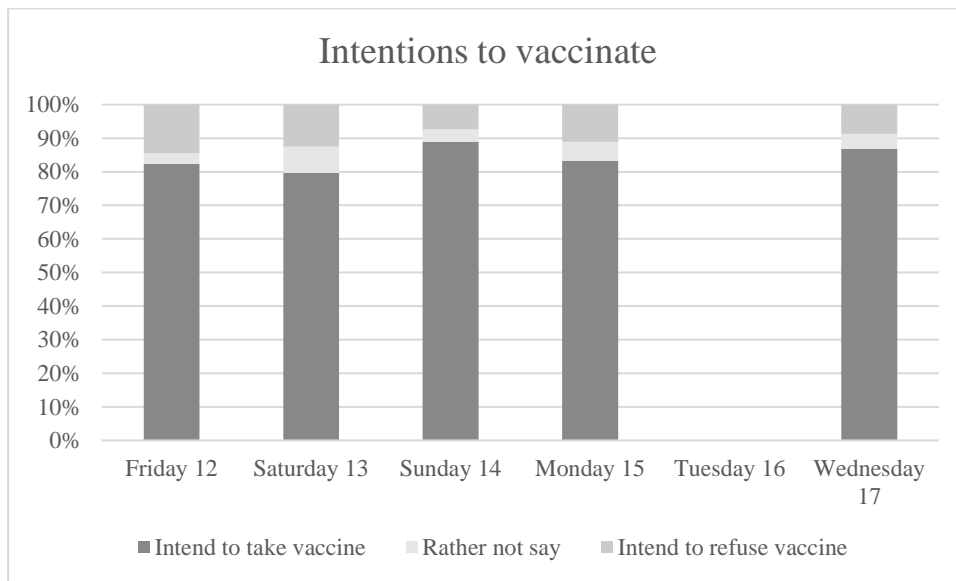
Figure 3: Intentions to Vaccinate by Day of Data Collection

Figure 3 depicts intentions as measured on each day of the survey. It implies no change in intentions over time. These results on intentions are consistent with those on attitudes.

Our three attitude items show a Cronbach's Alpha of .85, which implies that they are picking up a single factor. We reverse code the item "I am uncertain about the benefits of the Covid vaccine" so that higher numbers always indicate more positive attitudes. We report the mean of the three scale items related to the vaccine in the last column of Table 3, which describes mean outcomes on each variable for each day of data collection.

Table 3: Summary of Outcome Measures

Day	N	% intend (95% CI)	% refuse (95% CI)	Mean attitude (95% CI)
Friday 12	62	82.3 (72.4 – 92.0)	14.5	3.92 (3.65 – 4.19)
Saturday 13	64	79.7 (70.0 – 89.8)	12.5	3.82 (3.56 – 4.18)
Sunday 14	54	88.9 (80.2 – 97.5)	7.4	4.17 (3.95 – 4.40)
Monday 15	18	83.3 (64.3 – 100.0)	11.1	4.30 (3.98 – 4.61)
Tuesday 16	*Blood clot / AZ suspension becomes lead story in national news media*			
Wednesday 17	237	86.1 (81.6 – 90.5)	9.3	4.02 (3.91 – 4.15)

The results described in Table 3 imply that there was no change in the intentions and attitudes of the UK public in the aftermath of the blood clot / AZ suspension story. Table 4 reports the results of regression analyses that control for respondent characteristics.

Table 4: Results of Regressions of Intentions and Attitudes

	intend	intend	attitude	attitude	attitude	attitude
After	0.058	0.052	-0.019	-0.072	0.029	-0.024
	(0.042)	(0.044)	(0.134)	(0.136)	(0.114)	(0.118)
Online Search activity that day		0.001		0.005		0.005
		(0.001)		(0.003)		(0.003)
Covariates						
Age	0.001	0.001	0.007	0.006	0.011	0.010
	(0.002)	(0.002)	(0.005)	(0.005)	(0.004)**	(0.004)**
Female	0.027	0.028	-0.047	-0.044	-0.026	-0.028
	(0.032)	(0.032)	(0.099)	(0.099)	(0.085)	(0.085)
Unemployed	0.035	0.035	0.114	0.095	0.107	0.093
	(0.037)	(0.037)	(0.137)	(0.137)	(0.121)	(0.121)
Scotland	-0.963	-0.960	-0.151	-0.109	-0.220	-0.193
	(0.007)**	(0.008)**	(0.280)	(0.280)	(0.231)	(0.231)
England	-0.366	-0.355	-0.328	-0.285	-0.325	-0.294
	(0.035)**	(0.036)**	(0.244)	(0.245)	(0.199)	(0.199)
North	-0.918	-0.917	-0.799	-0.750	-0.780	-0.741
	(0.011)**	(0.012)**	(0.375)*	(0.375)*	(0.319)*	(0.319)*
Had covid	0.033	0.035	-0.180	-0.160	-0.201	-0.185
	(0.044)	(0.044)	(0.169)	(0.169)	(0.141)	(0.141)
Scale manipulation	-0.027	-0.026	0.127	0.141	0.051	0.065
	(0.036)	(0.037)	(0.137)	(0.137)	(0.118)	(0.118)
Wording manipulation	-0.033	-0.033	-0.062	-0.063	-0.043	-0.042
	(0.044)	(0.044)	(0.126)	(0.126)	(0.105)	(0.105)
Constant			4.082	3.740	4.044	3.733
			(0.299)**	(0.357)**	(0.243)**	(0.296)**
R^2			0.03	0.03	0.04	0.04
N	433	433	433	433	546	546

Notes: *Intend* indicates answering the question "Do you intend to get the Covid vaccine?" *yes* (vs. *no* or *rather not say*). *After* refers to responses collected on March 17th the day after the blood clot / AZ suspension story was front page news. The regressions of intend reports marginal effects from Probit models. The attitudes measure is the mean score from the items "I believe the Covid-19 vaccine's benefits outweigh any risks", "The Covid-19 vaccine is beneficial" and, reverse-coded, "I feel uncertain about the benefits of being vaccinated against Covid-19". The regressions of attitudes report OLS coefficients from a five-point scale. *Online Search Activity* is a continuous variable describing the daily data depicted in Figure 2. The omitted category for country is Wales. The omitted category for unemployed is people in various forms of employment; all retired respondents had already received the vaccine and so did not answer the intentions question. * $p<0.05$; ** $p<0.01$

For these analyses, we pool the data collected between Friday 12th and Monday 15th as *before* data and compare this against the *after* data collected on Wednesday 17th. Columns 1 and 2 report the results on intending to receive the vaccine (as opposed to refusing or choosing

"rather not say"). The results on attitudes for this same sample are reported in columns 3 and 4. Columns 5 and 6 report the results on attitudes for the sample as a whole ($n = 546$), inclusive of respondents who had already been vaccinated and so had not been asked the intentions question. The models in columns 2, 4 and 6 include an additional variable, *Online search activity that day*, intended to capture the level of public concern regarding the vaccine on the day that the respondent answered the survey. *Online search activity* is coded from the raw data depicted in Figure 2. It is an index of the number of Google searches that include the terms "vaccine" and "safe" on the day in question. So Monday 15th March takes a value of 100 and Friday 12th March takes a value of 33, as in Figure 2.

In no case do we find that intentions or attitudes differ across the *after* group and the *before* group. Online search activity – a measure of how concerned the UK public was regarding the safety of the vaccine – also failed to predict intentions or attitudes.

Discussion

We surveyed a cross-section of UK residents immediately before and immediately after a massive negative news event surrounding the most distributed vaccine in the UK. Our data show no discernible difference in the intentions or attitudes in the after group relative to the before group.

One limitation of this study is the sample. An ideal test of the effect of this news event would have recruited a large representative sample. Of course, we could not have known in advance that there was to be a news event and so achieving that ideal was impossible on this occasion. There are two potential concerns: noise resulting from a relatively small sample and bias resulting from a non-representative sample. On the first of these, our sample size is small compared with the 4,000 responses collected by Loomba et al. for the survey experiment that we referred to in the introduction[3]. That said, our sample size is not atypical of public opinion

research. The University of Michigan Index of Consumer Sentiment, which is specifically designed to identify change in attitudes over time, derives from a monthly survey of 500 respondents[22]. In any case, the key question is whether our study is underpowered to detect a true effect. In other words, if we had recruited 5,000 respondents from Prolific.co instead of 500, might we have concluded that there was a reduction in intentions and attitudes? The answer is no. If such a reduction were to be observed then we would observe a negative sign on the *after* coefficient in Table 4. In practice the coefficient is positive. A separate concern is biased sampling. The key question here is whether our convenience sample is atypical regarding their attitudes to the vaccine? One reassurance on this point is that levels of intention reported in our *before* sample (83%) are very similar to the rates of intention reported in a recent study on a representative sample of the UK population (82%)[23]. A second reassurance is that the results implied by our sample correspond well with other data. A YouGov poll of UK residents conducted within days of the blood clot / AZ suspension event found that 77% of respondents reported the AZ vaccine to be safe, a result that the author interprets as demonstrating that the event had "little to no impact on public confidence" in the UK[24]. Also, the intentions stated in our survey match well with the high level of demand for vaccines manifest in the UK in the days following the blood clot/ AZ suspension event. Just a few days after this news event took place, more UK residents received the vaccine in a single day than ever before[25].

A second limitation of this study is that it was not a randomised trial and so we cannot interpret the before / after comparison as a causal measure of the blood clot / AZ suspension event. There will certainly have been contemporaneous factors that changed between the close of *before* data collection on Monday morning and start of *after* data collection on Wednesday morning. That said, we can be confident that there was no more publicized news

relevant to vaccines (or anything else for that matter) than the blood clot / AZ suspension event that is the focus of this paper.

The core message of these data is reassuring – fears that the blood clot / AZ suspension story would have negative consequences for UK residents' vaccine uptake were unfounded. This is not to say that the event did not damage the effort against Covid-19. The results reported here are specific to the UK and early polling suggests a drop in confidence in other European countries[24].

These data do raise a puzzle however. Why is it that our data imply no effect of negative information regarding a vaccine where a survey experiment that presented respondents with negative information did find an effect? We can only speculate. One source of difference across the studies is the content of the negative information. For instance, in the Loomba et al. survey experiment[3] respondents were presented with the misinformation that the vaccine causes 97 percent of users to become infertile. Our study concerned a (unproven) link between the AZ vaccine and an extremely low probability of blood clots leading to death. Notwithstanding that our case concerned a low probability outcome, the possibility of death as an outcome is likely to inspire dread[26] and was taken seriously enough to prompt European countries to suspend use of the vaccine. A second point of difference is timing. The Loomba et al. survey experiment was conducted in September 2020[3], before any vaccine had yet been produced. At the time that we collected our data, 23m people in the UK had already been vaccinated[25] and so respondents to our survey had more knowledge with which to form their intentions than was the case for respondents to the survey experiment. That additional knowledge would be expected to deliver more robust – and hence less malleable – intentions. A third source of difference is that the experiment studied the effect of presenting information in the context of a survey. That has the advantage of allowing for clean causal estimation of information per se but it leaves out of the analysis the real-world responses evoked by such

information e.g. how the media covers the information. The current research adds an important data point to our understanding of how the public responds to negative news regarding a vaccine. It is the first study we are aware of to describe public response to negative news regarding a Covid-19 vaccine that takes account of the responses of state actors, the scientific community and the media. The data lead us to conclude that in the UK the cumulative effect of the initial story and of the media coverage of that event was zero.

Methods

Participants

Our data were collected using the Prolific.co web recruitment platform[21]. In order to be eligible to view our recruitment materials, respondents had to be over 18 and have IP addresses based within the UK (Scotland, England, Northern Ireland and Wales). The study was advertised as academic research on attitudes, expectations and perceptions with regard to the Covid pandemic and included a warning that the survey would cover topics of illness and death. Potential respondents could view further details on the survey front page, which elicited their informed consent. 11 of 557 respondents who viewed the informed consent declined the survey. Data collection for our *before* group began at 12.43pm on Friday 12th March and ran to 9.11am on Monday 15th March 2021 and yielded 241 responses. Data collection for our *after* group began at 10.56am on Wednesday 17th March and ran to 1am on Thursday 18th March 2021 and yielded 305 responses. Sample size was determined by the constraint that we wanted to collect data only on the day of March 17th in order to have a clean before / after comparison. The total sample comes to 546 usable responses. For reference, the sample size used to construct the Michigan Index of Consumer Sentiment, a prominent survey measure of attitude change, is 500. Descriptive statistics of respondent characteristics are presented in Table 2.

Procedures

The survey instrument was designed to test scale items related to worry and coping in response to the Covid-19 pandemic. After the informed consent page, respondents were asked a series of yes / no questions regarding their own experience of Covid-19 e.g. had they been diagnosed with Covid? The last of these questions asked "Do you intend to get the Covid-19 vaccine?" answered as yes / no / rather not say. This is the primary outcome variable in our analysis.

Over the screens that followed respondents were asked the extent to which they agreed with a series of statements. For instance, the opening item was "I find it hard to cope with the uncertainty caused by the pandemic". On the third such screen, respondents were asked three questions that are relevant to the current research:

"I believe the Covid-19 vaccine's benefits outweigh any risks"

"I feel uncertain about the benefits of being vaccinated against Covid-19"

and

"The Covid-19 vaccine is beneficial".

These items were answered on a five-point scale and are secondary outcomes in our analysis.

For completeness we report three superficial tweaks made to the *after* survey instrument relative to the *before* instrument. First, we dropped four screens of statements that followed our items of interest. Second, in a preregistered experiment in the *before* survey we had randomised between two response scales for the attitude questions. Some respondents answered on the scale "disagree strongly" to "agree strongly" and others answered on the scale "do not agree at all" to "absolutely agree". The two scales delivered responses that were

indistinguishable from one another.[a] For the *after* survey we opted to use just the "disagree strongly" to "agree strongly" scale. Lastly, we randomised the wording of an unrelated item in the first bank of statements in the after survey. In the *before* survey all respondents read "I continue to feel at risk from Covid-19". Some respondents in the after survey saw this item as "I feel at risk from Covid-19". None of these manipulations could have influenced responses on our primary dependent variable because we asked about intention before respondents saw any of these three variations. Also, the two question wording variations were randomly assigned and so we control for their effect in Table 4.

Ethics

The study was approved by the General University Ethics Panel at the University of Stirling under ethics application "Impact of COVID Fear 0485" on Thursday March 11th.

Analyses

We conducted all analyses using STATA 15.1.

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