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York at Buffalo (UB) into the effects of different passenger-queue lengths on how fast security screeners at a medium-size U.S. airport conducted their inspections of passengers' carryon baggage.

The researchers, who were from the Department of Industrial and Systems Engineering at UB's School of Engineering and Applied Sciences, divided passengers' carry-on items into four categories: trays containing shoes, keys, cash, and personal effects such as cell phones; carryon baggage such as small roll-on cases; small purses and small cases such as camera cases; and laptop computers.

Story continues below \downarrow



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They found that as the lengths of security wait lines grew at the airport, security screeners sped up their inspections of laptop computers. However, screeners didn't speed up while inspecting any other type of carry-on baggage or people's personal effects.

"If you're going to have a speed-up anywhere, it's probably safest to have it with laptops,

because that's a more difficult item to hide something in," said Rajan Batta, one of the researchers. "We didn't see a speed-up with carry-on bags, so that's reassuring."

Laptops are more uniform than bags

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"We don't know whether (the screeners) saw laptops" as passengers were waiting in line and — if queues were long — adjusted their inspection times for the laptops accordingly, said Colin Drury, a professor who was another of the researchers.

"But I can see that, if this does happen, the screeners are acting very sensibly by taking the easiest item" to inspect and speeding up the inspection to cut the queue waiting time, said Drury. "It looks like people have a sort of social responsibility (feeling) for this."

During more than 40 separate hour-long observations at the airport, the researchers found that when security

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screeners sped up their inspections of laptops because they saw long lines of passengers waiting, it had very little effect on the level of security onboard aircraft.

Any effect from speeding up laptop inspections "was way down on the level part of the curve," as far as its influence on the overall security level went, said Drury. "If the screeners sped up another few seconds (with laptops), they were unlikely to find anything more."

Findings reassuring to TSA

He added: "These findings will be reassuring to the Transportation Security Administration, because the speed-up we detected will not have a drastic effect on security. If it happens at one airport, I suspect it's not just at that airport" where screeners maintain the thoroughness of their inspections when they see long waiting lines.

At the deliberately unidentified airport at which the researchers conducted the study, they found that passengers had to join four separate queues while waiting for themselves and their personal effects to be screened.

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The first queue was to wait for their identity documents and boarding passes to be checked before they

entered the security

screening process proper, while the second was the back-and-forth "snake line" in which passengers waited before joining the queue for the body- and bag-scanning machines. The third was the main prescanning line, and the fourth queue for each person was the line in front of each individual scanning position.

"Screener service time changed more with queues that were closer," with the length of the closest queue to each screener having the biggest effect, said Drury.

"We went into this not knowing whether there would be an effect or not, and we found all the correlations were in the right direction. They were all nicely self-consistent," he said. "But what we never did find out is whether the screeners speeded up with a long line, or slowed down with a short line."

Queuing theory

The researchers think the findings of the airport study have wide general application in a sub-field of industrial engineering called "queuing theory." Although queuing theory was developed more than four decades ago, researchers have assumed until now that, no matter how long a queue is, the people servicing it don't speed up or slow down their service to each person in the line.

But the UB study suggests this isn't the case, and its results could have implications well beyond airports. In some cases where it is critical that servers do not speed up their service when lines are long, it might be desirable to hide or conceal the length of the line from them, said Drury. In other situations, it may be advantageous for service quality for the servers to be fully aware of the length of the queue.

The study's findings also could have implications at parts of airports other than security lines, such as check-in halls, baggage drop-off areas, parking garages, departure gates and baggage halls.

"Now I want to find out if there is a speed-up in some way when baggage handlers see a load of baggage coming, down in the baggage hall," said Drury.

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