

# OPUS 2

## INTERNATIONAL

London Bridge Inquests

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1 Friday, 24 May 2019  
 2 (10.06 am)  
 3 MR HOUGH: Good morning, sir. Our first witness is  
 4 Dr Ashley Fegan-Earl.  
 5 DR ASHLEY FEGAN-EARL (sworn)  
 6 THE CHIEF CORONER: Good morning, Dr Fegan-Earl.  
 7 A. Good morning.  
 8 THE CHIEF CORONER: Please do make yourself comfortable. If  
 9 you wish to sit or stand, whichever you feel more  
 10 comfortable doing. Can I simply ask if you have the  
 11 microphone close to you.  
 12 A. Of course.  
 13 THE CHIEF CORONER: And much of what you are going to say  
 14 I suspect is going to be translated so we will take  
 15 things at a pace that will help those who are  
 16 translating for others to hear in another language.  
 17 A. Yes, of course, sir.  
 18 THE CHIEF CORONER: Thank you.  
 19 Questions by MR HOUGH QC  
 20 MR HOUGH: Would you please give your full name for the  
 21 court.  
 22 A. Dr Ashley William Fegan-Earl.  
 23 Q. Dr Fegan-Earl, you understand I'm asking you questions  
 24 first on behalf of the Coroner?  
 25 A. Yes.

1

1 Q. You may then be asked some questions by other lawyers.  
 2 What is your profession?  
 3 A. I am a Home Office pathologist and consultant forensic  
 4 pathologist.  
 5 Q. Could you summarise your relevant qualifications,  
 6 please.  
 7 A. I hold the degrees of Bachelor of Science, Bachelor of  
 8 Medicine, Bachelor of Surgery. I hold the Diploma in  
 9 Medical Jurisprudence. I'm a fellow of the Royal  
 10 College of Pathologists and a fellow of the Faculty of  
 11 Forensic and Legal Medicine of the Royal College of  
 12 Physicians.  
 13 Q. In your capacity as a pathologist, did you perform  
 14 a post mortem examination on Christine Archibald on  
 15 8 June 2017?  
 16 A. I did, yes.  
 17 Q. Did you perform a post mortem examination on  
 18 Sara Zelenak on 6 June 2017?  
 19 A. Yes, that's right.  
 20 Q. Did you make reports as a result of both of those  
 21 examinations?  
 22 A. Yes.  
 23 Q. You may refer to those as you wish.  
 24 A. Thank you.  
 25 Q. And you appreciate you're being called to provide the

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1 conclusions of those reports?  
 2 A. Indeed, sir.  
 3 Q. I'm going to address Christine Archibald first, and then  
 4 you may be asked questions by others about her, and then  
 5 I shall ask you some questions about Sara Zelenak and  
 6 you may be asked questions about that report after that.  
 7 A. Yes, I understand.  
 8 Q. Let me just make this clear also: that it will be  
 9 necessary during your evidence to give some graphic  
 10 details of injuries and examinations?  
 11 A. Yes.  
 12 Q. But we shall be using body maps to illustrate the  
 13 injuries, which are obviously stylised images rather  
 14 than personalised images, but they are nevertheless  
 15 graphic in that they illustrate some very serious  
 16 injuries.  
 17 A. Indeed, sir, yes.  
 18 Q. May we begin, then, with Christine Archibald and the  
 19 external examination you carried out on her. Looking at  
 20 your report on page 4, what were the findings of your  
 21 external examination relating to her head and neck and,  
 22 while you are answering this question, may we have on  
 23 screen, please, {PM0094/4}?  
 24 A. This view of the head we see a series of abrasions or  
 25 grazes covering the right-hand side of the face.

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1 You can see the entire aspect of the nose, right cheek,  
 2 around the right eye, right forehead and onto the chin,  
 3 together with lacerations or tears to the lips.  
 4 Q. And then the next page, please, {PM0094/5}, is, I think,  
 5 a view of the crown?  
 6 A. Yes, an aspect looking at the back of the head and, at  
 7 number 8, there was a laceration, a tear through the  
 8 tissues of the scalp.  
 9 Q. May we then have page 3 of the same document, please,  
 10 Oli. {PM0094/3}.  
 11 A. A full view of the face showing that there are abrasions  
 12 not only on the right but also extending back onto the  
 13 left-hand side of the face. Number 10 refers to the  
 14 presence of blood within the ears, indicative of a very  
 15 serious head injury.  
 16 Q. I'm now about to ask you about your examination and  
 17 findings external to the anterior or forward-facing  
 18 torso. Even the body map in this respect is quite  
 19 graphic.  
 20 A. Yes.  
 21 Q. I make that clear before I show it. May we have page 6  
 22 of the same document, and could you please explain your  
 23 findings there? {PM0094/6}.  
 24 A. This graphic shows very extensive grazing over much of  
 25 the front of the torso and the breasts, and it also

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1 includes an extremely deep tear, a laceration, which is  
 2 indicated at number 13.  
 3 Q. The next page, please {PM0094/7}. What were your  
 4 findings to the posterior torso, the back?  
 5 A. Similarly, there's extensive grazing covering the  
 6 entirety of the lower back consistent with extensive  
 7 grazing and friction against the skin.  
 8 Q. What's the finding denoted by the number 16?  
 9 A. Number 16 represents within that area of grazing  
 10 a puncture wound, so an object entering the skin at that  
 11 point, but not a stab wound.  
 12 Q. The next page, please, I think we will look at the left  
 13 shoulder and back area {PM0094/8}.  
 14 A. We see there in addition to that grazing to the back,  
 15 higher up areas of lighter grazing with some slightly  
 16 patterned area of bruising at number 17, that may be the  
 17 weaving print of clothing.  
 18 Q. {PM0094/9}, please. This is the lateral aspect of the  
 19 left thigh?  
 20 A. Yes.  
 21 Q. What was your finding here?  
 22 A. So looking at the outer part of the left thigh, there  
 23 was an area not only of grazing, but also of burn-type  
 24 injury, the nature of which would be consistent with  
 25 contact with a hot surface and in this context, the

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1 undersurface of a vehicle.  
 2 Q. At {PM0094/10}, please, the left knee, outer aspect.  
 3 A. There there was a deep laceration, a tear just in the  
 4 front of the left knee, associated with grazing,  
 5 extending down part of the left lower leg.  
 6 Q. Then the next page, please {PM0094/11}, the inner aspect  
 7 of the left knee?  
 8 A. Where you see further areas of bruising and grazing.  
 9 Q. Next page, please {PM0094/12}.  
 10 A. Looking at the top of the lady's left foot you can see  
 11 a series of skin tagged abrasions, so grazes which have  
 12 raised small flaps of skin.  
 13 Q. Now moving to the right lower limb, the right leg  
 14 {PM0094/13}, please.  
 15 A. Extending over the outer part of the right thigh, we see  
 16 a mixture of grazing and bruising, but you can clearly  
 17 see there within that injury is a patterned element  
 18 consisting of intermittent parallel lines. So this may  
 19 be a patterned abrasion as an object has compressed this  
 20 area.  
 21 Q. What sort of object?  
 22 A. Potentially a tyre.  
 23 Q. The next page, please, {PM0094/14}, the right knee?  
 24 A. In a similar vein to the left knee, there were areas of  
 25 grazing to the inner aspect of the right knee.

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1 Q. And finally on the right leg, the right foot, page 15,  
 2 please {PM0094/15}.  
 3 A. In comparison with the left foot, similarly small areas  
 4 of skin grazing on the great toe.  
 5 Q. Moving to your examination of the upper limbs,  
 6 {PM0094/16}. What were your findings in relation to the  
 7 left upper limb, the left arm?  
 8 A. Not only was there bruising and grazing of that limb,  
 9 there were also fractures to the bones of the limb.  
 10 Q. And we'll look at those fractures in a moment.  
 11 A. Yes.  
 12 Q. Then page {PM0094/17}, please, what findings have you  
 13 made here?  
 14 A. Over the backs of the fingers, knuckles and on the backs  
 15 of the hand, you can see further small areas of grazing.  
 16 Q. And then moving to the right arm, the right upper limb,  
 17 {PM0094/18} at the elbow.  
 18 A. An injury complex over the right elbow comprising  
 19 grazing, and you can see there deep tears passing into  
 20 the elbow joint.  
 21 Q. And finally for the external examination, {PM0094/19},  
 22 the right shoulder.  
 23 A. Grazing you can see passing in a tongue from the back  
 24 top right shoulder downward in the region of the right  
 25 shoulder blade.

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1 Q. May we now move to your internal examination, take up  
 2 page 20 of the body maps {PM0094/20}, looking at the  
 3 section of your report headed "Central nervous system",  
 4 what fractures and other signs of internal injury did  
 5 you find to the head?  
 6 A. That image demonstrates some of the various bones that  
 7 make up the skull. There was extensive damage to these  
 8 bones, with a fracture to the occipital bone, which is  
 9 the bone at the back of the head, the temporal bone,  
 10 that on the side, either side of the head, the maxilla,  
 11 which is the upper jaw and the nose, and those fractures  
 12 on the side of the head further extended onto the base  
 13 of the skull, which would explain the bleeding that  
 14 I identified from her ears.  
 15 Q. What findings and signs of associated haemorrhage did  
 16 you find?  
 17 A. There was patchy subarachnoid haemorrhage, which is  
 18 bleeding beneath one of the fine membranes that covers  
 19 the brain, typical of impact-type trauma causing that  
 20 bleeding.  
 21 Q. I think associated with the damage to the maxilla, you  
 22 also found a fracture of the nose and loss of teeth?  
 23 A. Absolutely, so a relatively small area, so damage to  
 24 that region can cause extensive bony damage to a number  
 25 of areas.

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1 Q. Moving to the head and neck, what findings did you make  
 2 there?  
 3 A. In addition to the fractures to the jaw and loss of  
 4 teeth and the fracture to the nose, there were some  
 5 bruises within the sternomastoid muscles, which are the  
 6 large muscles that help us turn our head from side to  
 7 side. The spine in that region was intact.  
 8 Q. Next the cardiovascular system. What findings did you  
 9 make on internal examination in that respect?  
 10 A. The heart was completely healthy and without any natural  
 11 disease, however, there were two tears of the aorta,  
 12 which is the largest artery in the body, which leaves  
 13 the heart, arches up and passes down the spine, a tear  
 14 just as it left the heart and complete transection, so  
 15 cutting in two, lower down the spine. So that is  
 16 a significant critical and fatal injury.  
 17 Q. Thank you. The respiratory system next. What findings  
 18 did you make in that respect?  
 19 A. So there we're considering the ribcage and the lungs.  
 20 There was extensive bleeding, particularly over the  
 21 left-hand side of the chest wall. Blood was present in  
 22 the space between the lungs and the ribs and there were  
 23 fractures to each and every one of the ribs, both right  
 24 and left-hand side. This had given rise to tearing of  
 25 the lungs, collapse and bleeding.

1 Q. Consistent, again, with massive pressure to the torso?  
 2 A. Yes, absolutely, and extensive contact given that all  
 3 the ribs were multiply fractured, both right and  
 4 left-hand side.  
 5 Q. The gastrointestinal system, what findings did you make  
 6 in your internal examination in that respect?  
 7 A. In regard to the large tear that was shown on the torso  
 8 graphic, that extended into the abdominal cavity,  
 9 causing some bleeding, but no further critical findings  
 10 there.  
 11 Q. The liver and the remainder of the hepatobiliary system?  
 12 A. The liver showed an area of crushing, and that's not  
 13 surprising when one considers that the liver sits behind  
 14 and around the ribs on the right-hand side.  
 15 Q. Then the spleen and the reticuloendothelial system?  
 16 A. The spleen which lies beneath the ribs on the left-hand  
 17 side was part avulsed. In other words, its principal  
 18 blood vessels had been torn.  
 19 Q. Before we move to fractures, were there any other  
 20 significant findings of your internal examination?  
 21 A. No, in essence it showed that Ms Archibald was fit and  
 22 well at the time of her death; there was no natural  
 23 disease.  
 24 Q. May we have page 22 on the screen of the body maps  
 25 {PM0094/22}. By reference to this, what findings of

1 fractures and other musculoskeletal injuries did you  
 2 make?  
 3 A. We discussed fractures to the skull and, in passing,  
 4 fractures to the bones of the left arm. In addition to  
 5 the rib fractures that you can see there, if you look at  
 6 the diagram on the right-hand side, that is labelled  
 7 T10, which refers to the tenth thoracic vertebra. That  
 8 had been fractured completely in two which also would  
 9 have transected the spinal cord, it is an extremely  
 10 serious injury to the spine at that point.  
 11 There was, in addition, not only bruising of the  
 12 fat, but liquefaction of the fat, which will occur when  
 13 there is extreme pressure applied to those tissues, and  
 14 finally the tips of the vertebrae, the small knobs that  
 15 you can feel when you run your finger down your spine,  
 16 were sheared away, so indicative of major shearing  
 17 forces applied to the spine.  
 18 Q. Thank you. Did you also find in your musculoskeletal  
 19 examination findings consistent with the massive tearing  
 20 of the abdomen which you saw externally?  
 21 A. Yes.  
 22 Q. Moving to your conclusions, please, what were the  
 23 principal conclusions of these various findings?  
 24 A. I found that Christine Archibald was a well nourished  
 25 lady who showed no natural disease that could either

1 have caused or have contributed to her death. In my  
 2 opinion, she died as a consequence of an act of  
 3 terrorism. The circumstances I rehearsed briefly. In  
 4 my view, the injuries demonstrated were wholly  
 5 consistent with vehicular impact and, given the nature  
 6 of this incident, I can confirm there was no evidence of  
 7 any wound arising from a knife, nor was there any  
 8 evidence of any gunshot wound.  
 9 The injuries themselves are indicative of  
 10 a high-energy impact, and they were devastating, and in  
 11 my opinion, therefore, taking into account the extent  
 12 and gravity of those injuries, death would have been  
 13 near instantaneous. There is no medical treatment that  
 14 could have saved her life, however early that was  
 15 provided.  
 16 Q. May I just pause you there. One or two questions  
 17 arising from that, you say that death would have been  
 18 near instantaneous. Is it therefore your opinion that  
 19 Christine Archibald would not have suffered to any great  
 20 degree?  
 21 A. It is.  
 22 Q. Second, you say that no medical intervention, no matter  
 23 how early, could have saved her life. Do you mean by  
 24 that, no medical intervention even of the kind that can  
 25 be achieved in hospital?

1 A. It would not matter if a full operating theatre was  
 2 present: she could not be saved, given the extent of  
 3 those injuries .  
 4 Q. You were about to continue with your conclusions to deal  
 5 with the consistency of the findings with the mechanism  
 6 of injury .  
 7 A. My view was that the features are consistent not only  
 8 with a strike to an upright body by a vehicle , but also  
 9 with overrun, beneath the wheels of the vehicle . I say  
 10 this on the basis of the severe crushing injuries that  
 11 are present, the patterned areas on the legs , which may  
 12 be consistent with a tyre , and the presence of burn-type  
 13 injuries , which would be expected when there was contact  
 14 with hot surfaces of a vehicle beneath. My  
 15 understanding is that this accords with witnesses who  
 16 saw a body beneath the vehicle .  
 17 Q. The witness evidence and, indeed, the CCTV evidence,  
 18 suggests that Ms Archibald was struck, was then pushed  
 19 forward by the vehicle over the road surface , and was  
 20 released as she was driven into a central kerbed  
 21 reservation?  
 22 A. Yes.  
 23 Q. I gather from your explanation that all the injuries are  
 24 consistent with that mechanism?  
 25 A. Entirely so.

13

1 MR HOUGH: Thank you. Those are all my questions. There  
 2 may be some more for you.  
 3 Questions by MR PATTERSON QC  
 4 MR PATTERSON: Dr Fegan-Earl, I ask questions on behalf of  
 5 the family of Christine Archibald.  
 6 We have had evidence from the CCTV footage which  
 7 confirms that from the moment her body was released and  
 8 deposited in the middle of the carriageway, having been  
 9 carried forward some distance by the van, there were no  
 10 visible movements?  
 11 A. Yes.  
 12 Q. And, secondly, we've had evidence from members of the  
 13 public who were with her in the minutes that followed  
 14 this who have confirmed that there were no signs of life  
 15 at any stage. Does all of that support your findings  
 16 that death would have been near instantaneous?  
 17 A. Yes, that is entirely consistent with the pathological  
 18 findings, yes.  
 19 Q. The facial impact, and you've described the fracture to  
 20 the nose, to the jaw, the fractures plural to the  
 21 skull --  
 22 A. Yes.  
 23 Q. -- of them themselves could have rendered her  
 24 immediately unconscious, perhaps?  
 25 A. Certainly so. A skull fracture is evidence of

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1 application of severe force to the skull , and therefore  
 2 I would expect the delicate nerve fibres to be damaged  
 3 and therefore her to lose consciousness as a consequence  
 4 of that even if it had been the only injury .  
 5 Q. So before we even get to those critical and fatal spinal  
 6 injuries and the chest compression and all those other  
 7 terrible injuries , immediately she would have been  
 8 unconscious?  
 9 A. Yes, I can say that with confidence.  
 10 Q. So one thing that her family can perhaps take from your  
 11 evidence is that there would not have been any enduring  
 12 of any real significant period of pain?  
 13 A. Yes, that is right .  
 14 Q. We've had evidence that the estimated speed of the van  
 15 was something in and around 34 miles per hour at the  
 16 point of impact. Those injuries that you found,  
 17 Dr Fegan-Earl, both externally and internally , they were  
 18 horrific injuries , weren't they?  
 19 A. Yes, they were.  
 20 Q. You used the word "devastating" in your report?  
 21 A. Yes, they are, yes.  
 22 Q. And do they show only too graphically just how lethal  
 23 vehicles can be if they are used as weapons against the  
 24 public?  
 25 A. Indeed. I've stated this before. Even though 34 miles

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1 an hour may not sound like much, the energy transfer  
 2 when a body is struck is immense. If one then adds to  
 3 that an overrun, it clearly demonstrates that a vehicle  
 4 can produce multiple independently fatal injuries as are  
 5 demonstrated here.  
 6 Q. And a few months ago you had the sad duty of giving  
 7 similar evidence in relation to victims of the attack on  
 8 Westminster Bridge?  
 9 A. Yes.  
 10 Q. And, again, the evidence on that occasion was of rather  
 11 modest speeds by the terrorist 's vehicle .  
 12 A. Absolutely. But nonetheless, it's clear to see the  
 13 devastating injuries that such a vehicle even at low  
 14 speed can produce.  
 15 Q. And the vulnerability of the public if a terrorist  
 16 chooses to attack with a vehicle?  
 17 A. Plainly so.  
 18 MR PATTERSON: Thank you very much. That's all I ask.  
 19 Questions by MS SIMCOCK  
 20 MS SIMCOCK: Doctor, I ask questions on behalf of the London  
 21 Ambulance Service. Given your conclusions that , sadly,  
 22 Christine Archibald died near instantaneously, is it  
 23 likely that at that time -- I appreciate you are not  
 24 a clinician -- but is it likely at that time her heart  
 25 rhythm would have been asystolic?

16

1 A. It would have been asystolic. I have no doubt in that  
 2 at all.  
 3 MS SIMCOCK: Yes, thank you very much, thank you, sir.  
 4 Further questions by MR HOUGH QC  
 5 MR HOUGH: Dr Fegan-Earl, may we now move to your report  
 6 concerning Sara Zelenak.  
 7 Once again, do you record in your report a number of  
 8 external examination findings?  
 9 A. Yes.  
 10 Q. May we begin with your findings concerning Sara's left  
 11 leg, and for that purpose bring up {PM0104/3}. What  
 12 were the findings you made in relation to the left thigh  
 13 that are depicted on this body map?  
 14 A. For orientation here, we're looking at the front of the  
 15 lady's left leg, you can see two injuries, marked 1 and  
 16 2. On the outer part of the upper left thigh there was  
 17 a stab wound and my examination has shown that that  
 18 travelled through the muscles of the leg and exited at  
 19 injury number 2. This is therefore what is termed to be  
 20 through-and-through injury, and is consistent with the  
 21 passage -- the single passage of a knife passing from  
 22 her left to her right.  
 23 Whilst undoubtedly an injury such as this would  
 24 bleed, it did not damage major blood vessels so would  
 25 not have been an independently fatal injury.

17

1 Q. It was, however, a knife blow driven through the upper  
 2 thigh from the outer aspect to the inner aspect. Would  
 3 it have required considerable force to drive the knife  
 4 through the leg in that way?  
 5 A. When pathologists are asked to consider force they do so  
 6 by applying a relatively subjective scale of mild,  
 7 moderate and severe, based on the strength of the  
 8 structures damaged during the passage of a wound. In  
 9 this case, the skin would have been the most resistant  
 10 structure, and once that gave, the other tissues would  
 11 be relatively easily cleaved. However, it has had to  
 12 pass through a significant quantity of muscle and one  
 13 also has to take into account other factors, such as the  
 14 protective effect of clothing and the sharpness or  
 15 otherwise of the inflicting weapon. This would take, in  
 16 my view, when we think it's gone through the leg,  
 17 moderate to severe force.  
 18 THE CHIEF CORONER: And she was wearing jeans.  
 19 A. Indeed so, so therefore force is required to breach  
 20 those before one considers that. So, yes, that's why  
 21 the totality of that must be taken together.  
 22 THE CHIEF CORONER: Yes, thank you.  
 23 MR HOUGH: Just to be clear, you were provided with  
 24 information about her clothing which, at the time, was  
 25 denim jeans and a white shirt?

18

1 A. Yes. Yes.  
 2 Q. Next, please, {PM0104/4}. Does that show the size of  
 3 the entry wound of the knife on that occasion?  
 4 A. It does, and you can see it almost appears to be  
 5 a right-angled triangle, that would be indicative of  
 6 movement of the knife while in the wound.  
 7 Q. Does that also suggest a blow going directly in from the  
 8 side of the leg?  
 9 A. Oh yes.  
 10 Q. Next, please, may we have {PM0104/6} of the body map on  
 11 the screen. What finding here did you make of an injury  
 12 below the left knee?  
 13 A. What we have here is a slash wound. Briefly, the  
 14 difference between a stab and a slash is that a stab  
 15 penetrates deeper into the body than it measures long on  
 16 the skin, whereas a slash measures longer upon the skin  
 17 than it penetrates deeply into the body. That therefore  
 18 infers different planes of movement, a stab wound  
 19 occurring when the knife point moves towards the body,  
 20 a slash wound when it is moving in a parallel fashion.  
 21 It therefore would support a dynamic assault.  
 22 Q. Dynamic either because of the attacker moving or the  
 23 victim moving, or both?  
 24 A. Quite so, yes. The interplay between those two  
 25 individuals would be dynamic in nature.

19

1 Q. How deep did the wound penetrate in this area?  
 2 A. It's penetrated down into the muscle and it has, in  
 3 fact, scored the head of the fibula which is the thin  
 4 bone, one of the two lower bones in the leg.  
 5 Q. May we now move to your findings in relation to the  
 6 right lower limb, and {PM0104/7} of the body map  
 7 provides some degree of illustration here, but what were  
 8 your findings at the level of the right ankle?  
 9 A. This is a minor injury but it is an important one in the  
 10 overall interpretation, in my view. You can see over  
 11 the outer aspect of the lady's right ankle there was  
 12 a rounded bruise, and I found that the foot was  
 13 inverted, in other words, it was turned inward, such  
 14 that the big toe was higher than the little toe. So  
 15 there has been an injury here whereby the ankle has  
 16 turned, causing bruising of the overlying skin.  
 17 Q. You'll deal with the interpretation of that in your  
 18 conclusions, I think.  
 19 A. Yes.  
 20 Q. May we now move to the posterior torso, the back, on  
 21 {PM0104/8} of the body map. Did you find a stab wound  
 22 on the left side of the back?  
 23 A. Yes, indeed, a stab wound. It showed features that  
 24 allowed me to consider the use of a single-edged knife.  
 25 It passed for a number of centimetres through skin, fat

20

1 and into the muscle by the spine, but it did not enter  
 2 the abdominal cavity. The wound would bleed; it would  
 3 not be independently fatal.

4 Q. Using the same approach to force that you described  
 5 earlier, what would have been the force of this knife  
 6 blow?

7 A. Probably at least moderate on that scale of mild,  
 8 moderate and severe.

9 Q. {PM0104/9}, please, did you find a further sign of  
 10 a knife wound to the left side of the body?

11 A. Yes. Number 6, you can see a relatively superficial  
 12 wound passing into the fat only, and beneath that,  
 13 a further and slightly smaller wound passing into fat  
 14 only. The salient observation is that when one looks at  
 15 the relative orientation of those two injuries, they are  
 16 similar, if one uses the hands of a clock, 10 to 4  
 17 plane, the fact that they are closely located and  
 18 similarly oriented in my view would suggest a rapid  
 19 sequence of infliction in which there is little time for  
 20 relative movement between the victim and the assailant.

21 Q. So that would suggest a repeated and rapid stabbing at  
 22 the same area of the body?

23 A. A repeated and rapid stabbing, yes.

24 Q. Then page 10, please {PM0104/10}, did you find a further  
 25 stab wound to the upper back?

21

1 A. Yes, this was a stab wound which, once again, the  
 2 surface features suggested the use of a single-edged  
 3 knife. It penetrated through the skin, fat and muscle  
 4 of the back before scoring the inner part of the left  
 5 shoulder blade, but it did not penetrate into the chest  
 6 cavity. Whilst that wound would have bled, it would not  
 7 likely have represented an independently fatal injury.

8 Q. Given the degree of penetration and the degree of  
 9 scoring to the shoulder blade that you found, what force  
 10 would you say that injury represented?

11 A. It's a relatively limited score mark to the left  
 12 shoulder blade. I would say at least moderate force.

13 Q. Then the anterior torso, the front of the torso, page 11  
 14 of the body map. Did you find a further stab wound to  
 15 the left side of the chest {PM0104/11}.

16 A. Yes, we see a stab wound on the left side of the chest  
 17 there. In terms of its penetration, it entered through  
 18 skin, fat and muscle before bisecting, cutting in two,  
 19 the left fifth rib. It did not enter the chest cavity,  
 20 the reason most likely being that it was significantly  
 21 decelerated by impact against the rib. Therefore, for  
 22 this wound, severe force would have been required in  
 23 order to cause that fracture. The bleed would not be  
 24 independently fatal.

25 Q. Then page 12, please, and continuing to your examination

22

1 of the right arm, the right upper limb, what findings  
 2 did you make around the right elbow {PM0104/12}.

3 A. At the back of the right elbow were two minor grazes, so  
 4 certainly not life-threatening, consistent with contact  
 5 against a roughened surface such as pavement.

6 Q. So not a knife wound, but --

7 A. Not a knife wound, no, this is blunt injury, and the  
 8 most likely scenario would be pavement or some such.

9 Q. So of some assistance to your interpretation?

10 A. Yes.

11 Q. And then before we move to the head and neck, I think  
 12 it's right that you've indicated in respect of all the  
 13 injuries discussed so far that none of them would have  
 14 been independently fatal?

15 A. That's correct.

16 Q. Now moving to {PM0104/13}, please, and your examination  
 17 of the head and neck. Do we see here a number of stab  
 18 wound injuries which you found to the left side of the  
 19 neck, below and slightly behind the ear?

20 A. We shall observe once again with this group the close  
 21 location of the three injuries, and the similar  
 22 orientation, so the same applies in terms of a rapid  
 23 stabbing action. Number 11 is a stab wound with  
 24 features suggesting the use of a single-edged knife.  
 25 The wound has passed through the structures of the jaw,

23

1 struck the lower jaw, the mandible, and that has been  
 2 fractured, therefore severe force has been used for that  
 3 injury. It would bleed; it would not be independently  
 4 fatal.

5 Number 12, a slightly larger but relatively  
 6 superficial cutting wound, scoring into the muscle of  
 7 the outer part of the neck, but with no injury to any of  
 8 the major blood vessels or the nerves. So more of  
 9 a slash wound than a stab wound.

10 And 13, behind the ear, a gaping wound which went on  
 11 to represent a communicating through-and-through injury.

12 Q. I think we can see that if we go to the next page,  
 13 {PM0104/14} and we see an associated sign?

14 A. Absolutely, so those two injuries, 13 and 14, represent  
 15 the passage of just one pass of a knife, but which  
 16 traversed -- traverses the neck entirely.

17 Q. I think it's your view that that is the critical injury?

18 A. That is without doubt the fatal injury.

19 Q. And it's an injury inflicted, is this right, by a knife  
 20 being stabbed in from the left side and going through  
 21 the back of the neck from side to side?

22 A. Yes, 14 you see there is the exit of that wound track,  
 23 13 is the entrance located on the left-hand side of the  
 24 neck.

25 Q. We see {PM0104/15}. Have you here, or has the body map

24

1 here with your assistance depicted the track of the  
 2 wound?  
 3 A. It's confirming that it traverses the full thickness of  
 4 the neck from left to right.  
 5 Q. If we leave that image on screen as we move to your  
 6 internal examination, and the central nervous system,  
 7 did you make findings in relation to the internal  
 8 examination, the central nervous system, which were  
 9 linked with that injury?  
 10 A. Yes, I found that at the point at which the brainstem  
 11 leaves the skull to enter into the spinal column as the  
 12 spinal cord, it had been cut in two.  
 13 Q. So a complete severing of the spinal cord?  
 14 A. A complete severing of the spinal cord at an extremely  
 15 high level, and at that level, those are the areas which  
 16 are crucial to the control and maintenance of heartbeat  
 17 and breathing.  
 18 Q. Would that severing have occurred immediately the knife  
 19 went through?  
 20 A. Yes, and it has also damaged the bone, of course, to  
 21 access the spinal cord, the spinal cord passing through  
 22 the centre of the spinal column.  
 23 Q. May we look, please, at {PM0104/16}. Using this  
 24 illustration, what was the associated bony injury?  
 25 A. So there we are looking from the back, you can see the

25

1 bones of the neck, known as the cervical vertebrae, they  
 2 are numbered from 1 to 7, 1 being the highest, and 1  
 3 being at the junction of the head and the neck, so the  
 4 wound entered behind the left ear, traversed the  
 5 muscles, cut through that vertebra, including the spinal  
 6 cord and thereafter exited at number 14 on the  
 7 right-hand side.  
 8 Q. What degree of force would have been required for that  
 9 through-and-through injury?  
 10 A. Severe force.  
 11 Q. If we look at {PM0104/17} next, you have already  
 12 described many of the musculoskeletal injuries in  
 13 association with your other findings, but can you just  
 14 summarise what the other bony injuries were?  
 15 A. The injury to the scapula, the shoulder blade, was  
 16 relatively minor, it was a nick. There was a score mark  
 17 to the fibula, that bone in the lower left leg. The  
 18 more significant bony injuries were that to the  
 19 mandible, the lower jaw, and in my view, most  
 20 particularly, the left fifth rib, you can see  
 21 highlighted there, which had been fractured  
 22 horizontally.  
 23 Q. Were there any other abnormal or significant findings in  
 24 your internal examination other than tissue damage  
 25 associated with the various stab wound tracks which you

26

1 have described?  
 2 A. There were no additional novel findings, nor was there  
 3 any evidence of any natural disease: she was fit and  
 4 well at the time of this incident.  
 5 Q. Moving, then, to your conclusions, based on the post  
 6 mortem examination findings and the information you  
 7 received about the attack on Sara Zelenak, what  
 8 conclusions did you reach as to the cause and mechanism  
 9 of her death?  
 10 A. I found that Sara Zelenak was a well nourished young  
 11 lady with no natural disease that could have caused or  
 12 contributed to her death. In my view, she died as  
 13 a consequence of an act of terrorism.  
 14 My examination shows a number of stab wounds which  
 15 I've described as showing a distinct lateralisation to  
 16 the left-hand side of the body. If one reviews the  
 17 graphics, one sees that all of the principal injuries  
 18 are to the left-hand side of the body, none to the  
 19 right-hand side, the most critical injuries being that  
 20 to the neck.  
 21 Q. May I just pause you there for a moment.  
 22 A. So sorry.  
 23 Q. The injuries are, therefore, consistent with a knife  
 24 being applied repeatedly to the left side of the body  
 25 specifically?

27

1 A. Yes.  
 2 Q. A number of the injuries involved the application of  
 3 severe or moderate to severe force?  
 4 A. Yes.  
 5 Q. Some of the injuries were also indicative of speed in  
 6 the attack?  
 7 A. Yes.  
 8 Q. Rapid iterative use of the knife?  
 9 A. Yes.  
 10 Q. The evidence suggests that this attack took place over  
 11 a relatively short compass of time.  
 12 A. Yes.  
 13 Q. No more than 20 or 30 seconds.  
 14 A. Indeed.  
 15 Q. Are all these injuries then consistent with a short and  
 16 furious attack on the left side of the body?  
 17 A. Absolutely, and then one has to also consider why they  
 18 are not further distributed, which I come to later.  
 19 Q. Thank you. You were going to tell us about the most  
 20 critical injury.  
 21 A. Yes, the most critical injury to the neck, a transfixing  
 22 injury passing through the cervical spine and the spinal  
 23 cord. I would expect her to have died extremely rapidly  
 24 given the importance of the structures of the brainstem  
 25 and the spinal cord at this extremely high level.

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1 Q. What are the further injuries to which you attached  
2 significance?

3 A. To rehearse them: an injury to the face causing  
4 a fracture to the left -hand side of the jaw; a stab  
5 wound to the left -hand side of the chest, cutting the  
6 left fifth rib in two; the wounds to her left loin and  
7 those to her leg did not damage any critical structures  
8 and would not have been fatal. What there was not was  
9 a presence of defence wounds, in other words, injuries  
10 to the hands or to the arms which are very frequently  
11 seen in cases of fatal stabbing, given that an almost  
12 reflexive reaction in anticipation of a blow from  
13 an individual wielding a knife is to raise the hands,  
14 rendering them vulnerable to injury.

15 Q. May I pause you there a second. Is that absence of  
16 defence wounds therefore consistent with the  
17 incapacitating injury being delivered quite quickly,  
18 quite early in the attack?

19 A. Yes, given that she was a young and fit lady, one would  
20 expect after a delivering of a single blow for her to  
21 try and mount some form of defence. The absence is  
22 therefore important in that it suggests very rapid  
23 incapacitation and therefore in the context of the  
24 injuries that we have discussed, the injury to the neck  
25 occurring early on within that attack sequence.

29

1 Q. When that injury was inflicted, the through-and-through  
2 injury to the back of the neck, would that have achieved  
3 immediate incapacitation?

4 A. Yes.

5 Q. Would it have ended all pain?

6 A. Yes.

7 Q. So if it is right that that was inflicted early, any  
8 pain would have ended, similarly, early in the attack?

9 A. Yes.

10 Q. Now, you noted the blunt force ankle injury --

11 A. Yes.

12 Q. -- and the turning of the foot, which you said were  
13 important to your interpretation. Can you explain how  
14 they were important to your view of the case?

15 A. On my initial examination I found that she was wearing  
16 a pair of high-heeled shoes with straps extending up and  
17 around and above both of her ankles. It would therefore  
18 suggest, given that the foot is turned in, that she may  
19 have turned her ankle on her heels, causing her to fall  
20 to the floor. If that is the case, and she were to fall  
21 onto her right-hand side, then her left-hand side would  
22 be the only part presented to an attacker, and that may  
23 therefore explain the lateralisation of injuries to the  
24 left-hand side of her body.

25 Q. There has been some evidence to suggest that Sara may

30

1 have been running away from the attackers towards the  
2 top of some steps --

3 A. Yes.

4 Q. -- which may explain a stumble, a turning of the foot  
5 when wearing high-heeled shoes. That would, I gather,  
6 be consistent with your finding both of the ankle injury  
7 and the lateralisation of the stab wounds?

8 A. When one takes those two factors into consideration  
9 together, that is the conclusion that I draw.

10 Q. Thank you.

11 Now, turning to the wounds and the implement  
12 involved, may we bring up, please, {DC7283/85}. Now,  
13 Dr Fegan-Earl, we know that the knives used in the  
14 attack were those which can be seen in a row at the  
15 bottom of this page. Were the injuries consistent with  
16 blows from a knife of that kind?

17 A. I've mentioned earlier that there were features on some  
18 of the wounds showing the use of a single-edged knife.  
19 There we have presented knives which bear a single  
20 cutting edge. They appear to me to be of a typical  
21 cook's, chef's knife, and the approximate size of the  
22 stab wounds would be in keeping with the width of the  
23 knife as we see there. Therefore, in my view, they  
24 would be consistent with producing those injuries.

25 Q. In conclusion, what cause of death do you give at the

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1 end of your report?

2 A. Stab wound to the neck.

3 Q. Dr Fegan-Earl, is there any other information we need in  
4 interpreting Sara Zelenak's death, based on your  
5 examination and findings?

6 A. No, I don't think so. No.

7 MR HOUGH: Thank you very much. Those are all my questions.  
8 There may be some more.

9 Further questions by MR PATTERSON QC

10 MR PATTERSON: Dr Fegan-Earl, on behalf of the family of  
11 Sara Zelenak, can I have your assistance, please, on the  
12 family's behalf to try to piece things together  
13 chronologically?

14 A. Yes.

15 Q. Do I understand your evidence to be that with the  
16 wearing of the high-heeled shoes and that injury to the  
17 right ankle, this may all have begun with her losing her  
18 balance and going to the ground, or close to the ground,  
19 and then being attacked?

20 A. Sadly so, yes.

21 Q. You've highlighted the absence of defensive wounds to  
22 her hands or forearms. I think when you analysed her  
23 fingernails, they were painted --

24 A. Yes.

25 Q. -- and not a single one was damaged?

32

1 A. No.  
 2 Q. Which, again, would be consistent with somebody unable  
 3 to even raise a hand against this rapid attack?  
 4 A. It all points towards rapid incapacitation.  
 5 Q. From the CCTV evidence we've had and the evidence of a  
 6 member of the public, Erick Siguenza, it appears as  
 7 though the attack was over within just seconds. That  
 8 fatal injury through the neck would have very rapidly  
 9 caused death; is that right?  
 10 A. Yes, as a consequence of the sheer importance of those  
 11 structures at such a high level in the neck. The basic  
 12 functions of life are controlled within that area.  
 13 Q. So as opposed to a rupture of the column or the cord  
 14 further down --  
 15 A. Yes.  
 16 Q. -- at that position?  
 17 A. Yes, in my view it would cause a near instantaneous  
 18 death because of loss of control of the normal functions  
 19 of heartbeat and breathing.  
 20 Q. So consciousness would have ended immediately?  
 21 A. Yes.  
 22 Q. And, therefore, from the family's perspective, pain and  
 23 suffering would have ended immediately that that  
 24 happened?  
 25 A. I can say that with confidence.

33

1 Q. And as for treatment, even in the best conditions in  
 2 a hospital, would there have been any treatment that  
 3 could be given for such a significant injury?  
 4 A. No.  
 5 Q. You have highlighted two different areas where the  
 6 closeness of the wounds and the angle or orientation  
 7 suggests rapid infliction?  
 8 A. Yes.  
 9 Q. So to the face, the side of the neck?  
 10 A. Correct.  
 11 Q. And further down on the left side?  
 12 A. That's right.  
 13 Q. So little or no time for movement by her, if she was  
 14 conscious, to get out of the way of the ongoing assault?  
 15 A. Yes. Either very rapid infliction or, indeed, at that  
 16 point she's unable to move, and therefore unable to  
 17 change orientation between blows.  
 18 Q. Defenceless?  
 19 A. Yes.  
 20 Q. In two different parts of the body you have highlighted  
 21 what you have called through-and-through injuries?  
 22 A. Yes.  
 23 Q. Through the neck and through her thigh?  
 24 A. Yes.  
 25 Q. And in three different places you have been confident

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1 that severe force was needed to fracture the rib, to  
 2 fracture the mandible, the jaw, and to fracture the  
 3 spinal cord; is that correct?  
 4 A. That is true. I think I should add that when  
 5 pathologists comment, they're commenting on the minimum  
 6 force required. What we cannot, therefore, do, is if we  
 7 say something is requiring moderate force, we can't  
 8 exclude the fact that severe force was also employed.  
 9 Q. But in those three locations, it's the damage to the  
 10 bones, isn't it? It's the severing of a rib?  
 11 A. Yes.  
 12 Q. It's the fracture of the jaw and it's the severing of  
 13 the spinal cord that confidently allows you to say  
 14 severe force?  
 15 A. All of which are substantial bones which would  
 16 ordinarily put up resistance to the passage of a knife.  
 17 Q. If we consider those injuries to her neck, injuries 11,  
 18 12 and 13, and I should say, that isn't the order in  
 19 which they were inflicted, that was just numbering that  
 20 you gave for --  
 21 A. Simply the order in which I have identified the  
 22 injuries. It's not intended to denote the sequence.  
 23 Q. And you have already suggested that they may well have  
 24 been inflicted very early on in this attack?  
 25 A. Yes.

35

1 Q. But just considering those neck injuries, were any of  
 2 the major blood vessels damaged?  
 3 A. No.  
 4 Q. But the targeting of her neck, from what you've told us,  
 5 is what caused her death, that transfixing injury?  
 6 A. Yes, the neck is a small area that contains many  
 7 structures vital to life.  
 8 Q. So in this case we have one example of a particular  
 9 mechanism of death, but I don't know if you are aware,  
 10 but we have had evidence of casualty after casualty that  
 11 night who suffered neck injuries with those knives, some  
 12 of whom died. A very large number of neck injuries were  
 13 suffered. What are the dangers from stab injuries to  
 14 the neck area?  
 15 A. Well, a small area which is tightly packed with critical  
 16 structures, which include the carotid artery, the pulse  
 17 we can feel in our throat on either side; the jugular  
 18 vein, the vein draining blood from the head to the  
 19 chest; critical nerves; the windpipe and, of course, the  
 20 spinal column with the cord in it. All of those packed  
 21 in really a very small area, so any penetrating injury  
 22 to the neck brings with it an attendant risk of very  
 23 serious, if not fatal, injury.  
 24 Q. It's self-evidently an area of the body that is usually  
 25 unprotected?

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1 A. Correct.  
 2 Q. And life-threatening injuries can be suffered?  
 3 A. Yes, and as forensic pathologists we do encounter such.  
 4 Q. For example, the carotid artery involves blood at high  
 5 pressure being pumped from the heart to the head?  
 6 A. Yes, correct.  
 7 Q. And there can be rapid and heavy bleeding from an injury  
 8 to the carotid artery; is that right?  
 9 A. Indeed, and they are relatively superficial beneath the  
 10 skin. They're not buried deep within the body.  
 11 Q. So from public protection and public safety  
 12 perspectives, if you have a determined group of  
 13 terrorists acting very quickly, with multiple  
 14 casualties, life-threatening injuries can very quickly  
 15 be inflicted by targeting a vulnerable part of the body  
 16 like the neck?  
 17 A. Given the concentration of critical structures, yes.  
 18 MR PATTERSON: That's all I ask. Thank you, again, for your  
 19 help.  
 20 Further questions by MR HOUGH QC  
 21 MR HOUGH: Before you leave, just one final matter. One  
 22 notable feature of the London Bridge and Borough Market  
 23 attack is that all those who suffered fatal injuries  
 24 from stabbing suffered those injuries in the first few  
 25 minutes of the attack, but the attack continued with

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1 a number of other people stabbed, including with wounds  
 2 to the neck.  
 3 A. Yes.  
 4 Q. There may be many explanations of that, I just want to  
 5 ask you about one of them.  
 6 Does the infliction of multiple injuries in this way  
 7 require a lot of force and energy from the attackers?  
 8 A. Certainly if one looks at the presence of multiple  
 9 wounds and wounds that necessitate the use of severe  
 10 force, then one can infer that, yes, it will require  
 11 effort and energy to inflict and, of course, with  
 12 an increasing number of victims, that energy requirement  
 13 increases.  
 14 Q. Is it, therefore, possible -- and I only ask you this  
 15 based on all your experience -- that a loss of energy as  
 16 the attack goes on, by the attackers, may cause the  
 17 injuries to be penetrating less deep and with a less  
 18 high propensity for fatality?  
 19 A. I think that's difficult to answer with certainty. It  
 20 really depends on the dynamics of the assault. I'm not  
 21 sure I could answer that in a meaningful way.  
 22 MR HOUGH: That's very fair. Thank you very much. Those  
 23 are all the questions I have for you.  
 24 THE CHIEF CORONER: Thank you very much indeed,  
 25 Dr Fegan-Earl, for coming. As always, very clear

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1 explanations. Thank you very much.  
 2 A. Thank you, sir.  
 3 MR HOUGH: Sir, our next witness is Mr Savage but I wonder  
 4 if it might be convenient to take a short mid-morning  
 5 break at that point?  
 6 THE CHIEF CORONER: Yes. What I'm going to say, Mr Hough,  
 7 is because we are all anticipating that we will conclude  
 8 the evidence that we're going to take today before the  
 9 luncheon adjournment, what I'm going to suggest is that  
 10 we simply have a short, and I mean a short comfort break  
 11 now, and I think that way we are aiming to finish by  
 12 about 12.45, so at least everyone knows that's the plan.  
 13 MR HOUGH: Yes.  
 14 THE CHIEF CORONER: So what I'm going to say, by that clock  
 15 up there we will sit in 10 minutes' time.  
 16 MR HOUGH: Yes.  
 17 (11.07 am)  
 18 (A short break)  
 19 (11.20 am)  
 20 MR HOUGH: Sir, the next witness is Paul Savage.  
 21 THE CHIEF CORONER: Thank you.  
 22 MR PAUL SAVAGE (affirmed)  
 23 THE CHIEF CORONER: Good morning, Mr Savage.  
 24 A. Good morning, sir.  
 25 THE CHIEF CORONER: Please do make yourself comfortable. If

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1 you wish to take a seat, that's fine.  
 2 A. Thank you.  
 3 THE CHIEF CORONER: If you do sit down just bring the  
 4 microphone closer to you so that we can all hear what it  
 5 is you have to say. Again, if you can answer questions  
 6 not too quickly because much of what you are going to  
 7 say is likely to be translated.  
 8 A. Thank you, sir.  
 9 THE CHIEF CORONER: Thank you.  
 10 Questions by MR HOUGH QC  
 11 MR HOUGH: Would you please give your full name for the  
 12 court?  
 13 A. My name is Paul Victor Savage.  
 14 Q. Mr Savage, you understand I'm asking you questions first  
 15 on behalf of the Coroner and you may then receive some  
 16 questions from some other lawyers?  
 17 A. I do, sir.  
 18 Q. Is this right: you are giving evidence as an expert  
 19 having been instructed to prepare a report and give  
 20 evidence as to possible causes and mechanisms of death  
 21 for Xavier Thomas?  
 22 A. That is correct, sir.  
 23 Q. Would you please summarise your relevant qualifications  
 24 and experience as set out on page 2 of your report?  
 25 A. Yes, sir. So I am the immediate ex-Head of Medicine of

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1 the Royal National Lifeboat Institution, having been  
 2 their clinical lead and clinical operations manager from  
 3 2005 to 2014. I now currently work in a variety of  
 4 portfolio roles, one of which being a visiting fellow  
 5 lecturing on university paramedic science degrees.  
 6 Operationally I have been 31 years as a search and  
 7 rescue medic, 23 of those with the RNLI, eight with the  
 8 Coastguard and more importantly, the last six years  
 9 serving at Tower lifeboat station in central London.  
 10 I am the SAR advisor to the main board of the  
 11 Faculty of the Royal College of Surgeons, Edinburgh.  
 12 I am the chairman of the UK Search and Rescue Medical  
 13 and Survival Group which feeds up through the UKSAR  
 14 Operators and Strategic Group to form UK Government  
 15 policy on pre-hospital medicine and I have a specialist  
 16 interest in submersion, immersion, hypothermia and  
 17 drowning.  
 18 THE CHIEF CORONER: And SAR I think is search and rescue?  
 19 A. SAR is search and rescue, sir, yes.  
 20 MR HOUGH: In very brief summary, you are an extremely  
 21 experienced and expert search and rescue medic?  
 22 A. Yes, sir.  
 23 Q. May I begin with some explanation of terms. Can you  
 24 explain shortly what is submersion and the mechanism of  
 25 drowning referred to as submersion drowning?

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1 A. When a person enters the water you can be in one of two  
 2 states: even the medical profession don't fully agree on  
 3 the definition of submersion, but the wide agreement on  
 4 submersion is the airway, being that the mouth and nose,  
 5 completely underwater. That can be your patient  
 6 completely underwater or that could be somebody having  
 7 their head in a bucket of water, but the complete  
 8 respiratory mechanism is underwater, as opposed to  
 9 immersion, where the person is floating in water with  
 10 their head clear, eg, swimming, bobbing in a lifejacket,  
 11 or kicking water.  
 12 Q. What is the means and mechanism of drowning by  
 13 submersion for an unconscious person who is  
 14 free-floating in water?  
 15 A. An unconscious patient free-floating in water will  
 16 usually be face-down. Unconscious they would not have  
 17 a voluntary breath hold, and therefore you would expect  
 18 them to breathe normally. Breathing normally in this  
 19 case, they would actually breathe water as opposed to  
 20 breathing air. That water will enter their lungs. If  
 21 it is saltwater, the water tends to sit in the lungs,  
 22 actually physically filling them up. If it is  
 23 freshwater it tends, at times, to pass through the lungs  
 24 into the bloodstream, but in doing so, takes away  
 25 a specialist chemical which holds the very end of your

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1 lungs open. Either which way, saltwater you end up  
 2 waterlogged; freshwater, your lungs end up collapsed.  
 3 Either way you cannot get oxygen into your bloodstream.  
 4 Either way proceeds to an oxygen-deprived cardiac  
 5 arrest.  
 6 Q. That, I think, is because oxygen can't pass the lung  
 7 membrane into the bloodstream?  
 8 A. That is correct, sir.  
 9 Q. Are there characteristic signs of submersion drowning  
 10 found at post mortem?  
 11 A. Normally, and please accept I'm not a pathologist, but  
 12 normally they will find significant post mortem signs of  
 13 either pulmonary oedema, frothing and evidence that  
 14 actually water has been taken into the lungs.  
 15 Q. You said "normally": what's the significance of  
 16 "normally" in that context?  
 17 A. My understanding on the post mortem of Mr Thomas is that  
 18 that wasn't the case.  
 19 Q. Now, my question is slightly different. You said that  
 20 when somebody drowns through submersion drowning, so  
 21 through being unconscious and taking in water, breathing  
 22 in water in the way that you have described, there will  
 23 normally be at post mortem, frothy liquid in the air  
 24 passages, heavy lungs waterlogged with fluid?  
 25 A. That is correct, sir.

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1 Q. Is that an invariable finding when there has been  
 2 submersion drowning?  
 3 A. In the case where actually submersion drowning is the  
 4 primary cause of death, there should be obvious signs at  
 5 post mortem of that.  
 6 Q. So the absence of those signs, where they are absent,  
 7 indicate that the mechanism of death has not involved  
 8 simple submersion drowning with water simply being  
 9 breathed into the lungs?  
 10 A. That is correct, sir.  
 11 Q. As you've indicated, there weren't signs of that kind at  
 12 post mortem for Xavier Thomas. We'll hear about his  
 13 post mortem later, but you have reviewed the report of  
 14 that post mortem?  
 15 A. That is correct, sir.  
 16 Q. Therefore, we have to look for a different form of  
 17 mechanism of death.  
 18 Can you now describe what is meant by immersion in  
 19 your field?  
 20 A. Yes. The human being entering cold water undertakes  
 21 a variety of physiological impacts, and it's often  
 22 times, especially in UK waters, that patients are killed  
 23 by the effects of immersion rather than submersion.  
 24 The first impact of the human body in immersion in  
 25 cold water, and I ought to define cold water for you.

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1 So the studies show that cold water starts at  
 2 25 degrees C, which is above the UK water temperature at  
 3 pretty much all times around the coast of the UK.  
 4 Q. You have to be interpreted. If you can try to speak up,  
 5 speak into the microphone and speak a little more  
 6 slowly, please?  
 7 A. No problem, sorry.  
 8 THE CHIEF CORONER: The point, I think, was about the  
 9 temperature. So you were just explaining ...  
 10 A. The effects of cold water immersion tend to start at  
 11 25 degrees C, the very first effects. They build when  
 12 they reach 17 degrees C, and the worst effects are seen  
 13 in water of 10 degrees C or less.  
 14 The first physiological impact of the water is  
 15 a mechanism called cold shock, which has been well  
 16 documented since the 1990s.  
 17 MR HOUGH: Looking at cold shock for a moment, at what  
 18 temperatures is cold shock a relevant effect?  
 19 A. In lab studies, anything from 25 degrees C down. Having  
 20 said that, the effect builds as you arrive at  
 21 17 degrees C, building to its greatest effect at  
 22 10 degrees C and lower.  
 23 Q. What in physiological terms is cold shock? How does it  
 24 affect the body?  
 25 A. Cold shock is stimulated by receptors in the skin, and

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1 it's caused usually by a whole body immersion,  
 2 an unplanned whole body immersion. Therefore, if you  
 3 creep into water slowly, you will never be a victim of  
 4 cold shock, whereas if your skin is allowed to get wet  
 5 en masse simultaneously, there is a mass firing of these  
 6 receptors in your skin that produces a large effect in  
 7 your body, the cold shock effect. This effect has two  
 8 distinct sides: one side is a respiratory effect. That  
 9 respiratory effect is a massive inhalation gasp of  
 10 anything up to 2 litres of volume, uncontrolled. You  
 11 cannot control that gasp.  
 12 Q. Now, just pause there a second. You said that when all  
 13 these receptors across the body fire simultaneously,  
 14 there is a gasp of up to 2 litres?  
 15 A. That's correct.  
 16 Q. Can that be 2 litres of air?  
 17 A. It can be 2 litres of air if you are out of the water at  
 18 that time, and if you are submersed, it will be 2 litres  
 19 of water.  
 20 Q. What follows that initial involuntary gasp?  
 21 A. From the respiratory side of cold shock you then follow  
 22 about a 2 to 3-minute period of uncontrolled physiology.  
 23 In that time, you can expect a breathing rate in the  
 24 region of 60 to 80 breaths a minute, which is the  
 25 equivalent of human panting, and, most crucially,

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1 an inability to voluntarily breath-hold. Therefore the  
 2 victim cannot choose to hold their breath.  
 3 However, and importantly, the other side to cold  
 4 shock can be an instantaneous cardiac arrhythmia.  
 5 Q. Just before we get to that, if the gasp followed by  
 6 panting is to have a fatal effect, would that be through  
 7 the taking in of water as the gasp and panting occur?  
 8 A. That is correct.  
 9 Q. So if it is the respiratory effect of cold shock that  
 10 leads directly to death, that too would be marked on  
 11 post mortem by frothy liquid in the air passages and  
 12 waterlogged lungs?  
 13 A. That is correct.  
 14 Q. So is it right that since that was not found in  
 15 Monsieur Thomas, we can rule out the respiratory effects  
 16 of cold shock having an immediately and directly fatal  
 17 effect?  
 18 A. My best opinion on that is yes.  
 19 Q. You are now going to tell us about a separate set of  
 20 processes resulting from cold shock, which are  
 21 cardiovascular in nature?  
 22 A. That is correct, sir. So the other side to cold shock  
 23 is you can suffer an instantaneous cardiac arrhythmia,  
 24 producing instantaneous death. At that point, your  
 25 heart is in usually the rhythm of ventricular

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1 fibrillation and you are incapacitated in cardiac  
 2 arrest.  
 3 If that mechanism of cold shock happens, you would  
 4 not have the respiratory side of cold shock occurring.  
 5 Q. So the effect, if I understand it correctly, is that the  
 6 receptors, firing due to the shock of the cold to the  
 7 body instantaneously, have an effect on the electrical  
 8 rhythm of the heart, causing the heart to have  
 9 an irregular rhythm, and an irregular rhythm of the  
 10 heart can lead to a cardiac arrest?  
 11 A. Yes. The cold shock mechanism produces an irregular  
 12 rhythm of the heart that is not compatible with life.  
 13 Q. Would it be possible at post mortem to detect that that  
 14 had happened to the heart?  
 15 A. No, as electrical activity effectively dies with the  
 16 patient.  
 17 Q. Would there be any sign of it in the tissues or muscles  
 18 of the heart?  
 19 A. Unlikely.  
 20 Q. In your report, do you also refer to a process known as  
 21 autonomic conflict, which has been the subject of recent  
 22 research and thinking?  
 23 A. I do, sir. Autonomic conflict is a new phenomenon that  
 24 has been undergoing research and is still currently  
 25 undergoing research so I must stress that it is not

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1 fully understood at this moment in time. A lot of its  
2 models are hypothetical, but it is part of significant  
3 research being undertaken currently. The first time  
4 this concept came to light was in 2012 and was  
5 documented in research papers of that year. Autonomic  
6 conflict is an interesting phenomenon that our nervous  
7 system is split into two halves: we have a voluntary  
8 nervous system that is allowing me to talk to you and  
9 wave my hands, and we have an involuntary nervous system  
10 called the autonomic nervous system, that's what's  
11 making us digest our food and breathe in a certain  
12 fashion and our eyes open and close to light, et cetera.  
13 Those are functions out of our control.

14 If we look at the two sides of the nervous system,  
15 the voluntary and the autonomic, autonomic conflict  
16 focuses purely on the autonomic side. The autonomic  
17 nervous system itself is bisected in two, something  
18 called sympathetic and something called parasympathetic.

19 Sympathetic most people understand as fight or  
20 flight, the fight or flight reflex that human beings  
21 have when they are put under duress or fear, with a fast  
22 heart rate, a fast breathing rate, big wide eyes,  
23 adrenaline-driven.

24 The other side to the nervous system, the  
25 parasympathetic nervous system, is unlike fight or

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1 flight, is known as feed or breed. It is our digestion,  
2 it is us in a far more relaxed fashion. Now normally  
3 these two sides of the nervous system never meet. They  
4 co-exist to drive bodily functions in opposite  
5 directions. The work is being done at the moment that  
6 when a patient is under the cold shock mechanism and  
7 they are being what we call sympathetically-driven, eg  
8 their nervous system on the sympathetic side is  
9 massively energised, and then they can get a focused  
10 stimulation of the parasympathetic nervous system which  
11 only comes from a wet face.

12 So it could be, for example, a patient who is in  
13 water with head clear having horrendous cold shock  
14 symptoms but not under the surface of the water and  
15 therefore not drowning, and then getting a focused wet  
16 face. What they have found when you implant the two  
17 nervous systems on top of them is absolutely obvious  
18 ECG, electrocardiograph heart rhythm changes.

19 Now, in young, fit subjects they are not fatal, but  
20 the hypothesis is that in anybody with predisposing  
21 cardiac pathology, or anybody with any weak side to the  
22 cardiac system, those arrhythmias could be fatal.

23 Q. Just to understand how this autonomic conflict works,  
24 you've told us that the cold shock response, all these  
25 receptors in the body firing as a result of immersion of

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1 the body in cold water, can have an effect on heart  
2 rhythm. Can that induce a fast heart rate?

3 A. Yes.

4 Q. You have also said that at the same time, a person's  
5 face may be cooled rapidly, suddenly. Can that cooling  
6 of the facial area on its own, through the autonomic  
7 system, lead to a lowered heart rate?

8 A. Exactly. The cooling of the face in isolation is known  
9 as the mammalian dive reflex. It is very rarely seen  
10 unless people are in significant protective equipment,  
11 for example, a drysuit, crash helmet, gloves, and the  
12 only part of their body that gets wet is their face,  
13 because it is driven from nerves in and around the mouth  
14 and nose. In isolation, that produces a very, very slow  
15 heart rate and a very, very slow breathing rate and  
16 takes its name from the concept of a deep diving whale,  
17 hence the mammalian dive reflex.

18 Q. So putting it simply, with cooling of the body and the  
19 face, one part of the autonomic system may be telling  
20 the heart to go faster, while another part is telling it  
21 to go slower?

22 A. That is correct, sir.

23 Q. And what is the effect of these conflicting impulses?

24 A. The effect of the conflicting impulses is an obvious, on  
25 electrocardiograph, change in the heart rhythm, and in

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1 the presence of any predisposing cardiac pathology,  
2 those changes to the heart rhythm are believed to be  
3 potentially fatal.

4 Q. Would that occur or could that occur in somebody who had  
5 never displayed known cardiac problems?

6 A. Because this is at the research phase, it's incredibly  
7 difficult -- it would be subjective of me to answer  
8 that, but in the research done, the candidates are  
9 highly screened to make sure that they have no  
10 predisposing cardiac pathology because of the potential  
11 risk. As to looking at it from a perspective of how  
12 that sliding scale of cardiac pathology leads to  
13 fatality, that hasn't been investigated.

14 Q. May I now ask you briefly about two immersion processes  
15 which are unlikely to be relevant in the present case.  
16 First of all, can you briefly explain what peripheral  
17 cooling is, how it occurs, and how quickly?

18 A. When a patient or victim is in the water but maintaining  
19 their head above water and has potentially survived the  
20 first three minutes of immersion, which is the cold  
21 shock period, if you've had a cold shock response, at 3  
22 minutes that response has gone. You are now left  
23 floating, treading water as you wish, in the absence of  
24 any buoyancy, and by that I mean in the absence of  
25 a lifejacket or suchlike.

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1 What happens when you are in water below your body  
 2 temperature is by the method of conduction of heat from  
 3 yourself to the water, you will start to give away your  
 4 body temperature to the water. However, it is only the  
 5 limbs that suffer at this stage and that is because the  
 6 limbs have a high surface area compared to their mass,  
 7 and therefore they cool much faster than the core, and  
 8 therefore you end up with limbs at a significantly  
 9 different temperature than the core of the patient,  
 10 which is why we do not talk about core hypothermia in  
 11 this stage of the problem.

12 And at this stage of the problem, where we are  
 13 looking roughly in the 3 to 30-minute window of  
 14 immersion, your arms slowly cool, and when you reach  
 15 a temperature in the mid-20s degrees of tissue, the  
 16 junction between the nerve and the muscle fibre starts  
 17 to fail and therefore your arms and limbs become  
 18 relatively useless and you find that people cannot  
 19 control their limbs and therefore, if they are relying  
 20 on these for either self-rescue or swimming or buoyancy,  
 21 then at that stage, they tend to go subsurface, which  
 22 then leads them to a submersion drowning.

23 Q. First of all, the temperature of the Thames at the time  
 24 of Xavier Thomas' drowning was, you understood, about  
 25 20 degrees centigrade; is that right?

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1 A. That's correct, sir.  
 2 Q. At that temperature, given Xavier's age and likely  
 3 strength, within what period would this phenomenon have  
 4 prevented him from treading water?  
 5 A. At 20 degrees C with a normal, fit individual, who --  
 6 I do believe Mr Thomas could swim, and therefore was  
 7 used to water, you would expect him to be able to stay  
 8 at least 30 minutes above the surface, if not longer.  
 9 At 20 degrees you would be looking into the sort of at  
 10 least sub one hour period.  
 11 Q. Given that Monsieur Thomas was not seen above the  
 12 surface by vessels which arrived within approximately  
 13 6 minutes of him entering the water, and which continued  
 14 to search for some time thereafter, is it very unlikely  
 15 that he was treading water for half an hour or more?  
 16 A. I think we can say with as much certainty as we can  
 17 possibly say, and anecdotally from having rescued,  
 18 unfortunately, too many people from the Thames, anyone  
 19 who wants rescuing in the Thames, we know about: you can  
 20 hear them, they call for help. I think we need to look  
 21 at the fact that on this night, after the terrorist  
 22 event, the river was closed, and therefore the river was  
 23 quiet. The London Bridge area is better than other  
 24 areas in the Thames, which are littered with  
 25 obstructions, and by that I mean piers and vessels and

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1 moorings, and whilst there are some, there are not many,  
 2 and therefore anecdotally, the majority of patients that  
 3 we treat who come off of London Bridge are easy to find  
 4 on the surface because of the area that it is in.

5 There are also areas of steps, there are chains to  
 6 grip hold of, there's a variety of self-rescue methods  
 7 as well. Whilst I was not there on the night, I do feel  
 8 strongly that had Mr Thomas been on the surface, he  
 9 would have identified his presence and he would have  
 10 been found.

11 Q. Is a further reason for ruling out peripheral cooling  
 12 that that leads to death indirectly through submersion  
 13 drowning, which would show the signs on post mortem of  
 14 waterlogged lungs and so on which were not found?

15 A. Exactly, sir.

16 Q. The final process which I think you concluded similarly  
 17 is not relevant here, hypothermia. How does that occur  
 18 and within what time frame?

19 A. Central core hypothermia, if we start with the idea that  
 20 we enter the water at 37 degrees in our core, and  
 21 between 37 and 35 is deemed to be cold, between 35 and  
 22 downwards is deemed to be hypothermic, with the most  
 23 interesting or important markers being a 30-degree  
 24 temperature where you would expect your patient to lose  
 25 consciousness, and at 27 to 28 degrees C where you would

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1 expect your patient to have an arrhythmia, a bad rhythm  
 2 of the heart which is not sustainable with life.

3 Now, in 20 degrees C water in a lightly clad male,  
 4 we would expect survival times -- I mean, when you look  
 5 at the survival graphs which are given to the rescue  
 6 services to promote their search duration, they look at  
 7 the maximum survivability of a human being in that  
 8 temperature of water, and in 20 degrees C water, the  
 9 maximum survival of a lightly clad male is over 40 hours  
 10 before we have core submersion. That is the sort of  
 11 search durations that they would keep a coastal search  
 12 going for. Therefore, hypothermia is something that  
 13 just isn't relevant in this case at all.

14 Q. May we now move on to the third part of your report from  
 15 page 5, some general points about falls from  
 16 London bridges. Approximately how many falls from  
 17 London bridges take place each year?

18 A. Anecdotally, sir, we have in the region, depending on  
 19 the severity of the year, anything between 50 to 100  
 20 people choose to enter the Thames or accidentally into  
 21 the Thames from bridges. Anecdotally, and there is no  
 22 formal evidence on this, but anecdotally, very few, if  
 23 none, suffer any musculoskeletal injury, and by that  
 24 I mean broken bones and associated injuries with broken  
 25 bones, unless they hit bridge structures and buttresses.

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1 Therefore, the majority of patients that free-fall  
2 from a bridge to the water we do not see significant  
3 disabling musculoskeletal injuries in those patients.  
4 Q. May I now ask you about the next section of your report,  
5 section 4, which concerns the position of the body in  
6 water and particularly how that is relevant to  
7 Xavier Thomas' case.

8 We know that he was wearing jeans, a jacket, boots  
9 and a shirt, ordinary clothes, obviously no lifejacket  
10 or anything like that. Having regard to those clothes  
11 and the natural buoyancy of a body, at what level would  
12 you have expected him to rest in water without  
13 considering for the moment speed and nature of entry to  
14 the water?

15 A. Anybody floating in water incapacitated, so either  
16 unconscious or in arrest, will either be just on the  
17 surface or anything up to 1 to 2-foot subsurface during  
18 the early stages of immersion in the water.

19 We teach our crews to look for the equivalent of  
20 a pillow case, an inflated pillow case, because often  
21 times the only part of the body that you'll spot is, we  
22 oftentimes get an air pocket over the top of the  
23 shoulders, caught in clothing, acting like an impromptu  
24 lifejacket, and sometimes you pick up the back of  
25 the person's head and other times you pick up the top of

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1 their clothes because most patients incapacitated in  
2 water will have face under, arms out in a cruciform  
3 pattern, and their body at about 45 degrees, chest down,  
4 face under, and the air pocket behind their shoulders.

5 If people go in either naked or lightly clad,  
6 depending on their body structure, and that is basically  
7 fat versus muscle, then you can expect the person to  
8 potentially hover anything up to 1 to 2 foot subsurface  
9 at that point in time, in the absence of body fat, in  
10 the absence of any buoyant clothing.

11 Q. Is it right that a fall into water can propel somebody  
12 a certain distance into the water, a certain depth into  
13 the water?

14 A. Depth becomes crucial when we look at a phenomenon of  
15 the body called natural and neutral buoyancy. As  
16 a human being, in water of less than 5 metres depth, if  
17 we take our body and we take it down to 1 metre or  
18 2 metres and we release it, you would expect that body  
19 to return to the surface or to this sort of floating  
20 position I've indicated, the sort of 1 to 2 foot  
21 subsurface, depending on body structure.

22 But the crucial depth for this is at 5 metres. When  
23 you reach 5 metres depth, the pressure of the water is  
24 enough to remove any buoyant air spaces in your body,  
25 and a human being will continue to sink from 5 metres

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1 down. So the sort of terminology we use in search and  
2 rescue is from 5 metres down you have to actively strike  
3 for the surface, and as you swim up to the 5-metre point  
4 you almost feel your buoyancy appear and then your  
5 swimming effort gets less, but below the 5-metre point  
6 you have to strike for the surface and, therefore, if  
7 you are below 5 metres, with the inability to strike to  
8 the surface, you will continue to sink.

9 Q. Does the depth to which you penetrate, and in particular  
10 whether you go below that 5-metre level, depend to  
11 an extent upon the way in which you enter the water?

12 A. It certainly does, sir. If you come off and flail or  
13 fall horizontally and your arrival to water is in any  
14 way, shape or form in the sort of horizontal plane, it  
15 is highly unlikely that you will penetrate past  
16 5 metres. Unless, unfortunately, some of our victims  
17 choose to wear rucksacks full of bricks and they will  
18 continue to penetrate because of the extra weight that  
19 they were choosing to wear. In this case, if we had  
20 a horizontal entry to the water, it is highly unlikely  
21 that there will be any penetration past 1 or 2 metres.  
22 Whereas if we enter the water vertically, either  
23 face-first or feet-first, coming in from a height of  
24 13 metres, which was the fall height on the night, it is  
25 highly likely if you are in a vertical plane you will

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1 penetrate past 5 metres.

2 Q. Presumably there are intermediate positions between  
3 vertical and absolutely horizontal. May we take it that  
4 the degree to which one enters away from the vertical  
5 will reduce the penetration into the water?

6 A. Yes, and it also depends as well on arm position. So if  
7 you are anticipating the entry and you therefore assume,  
8 for example, a diving position and put your hands in  
9 front of your face as if you are diving into water, then  
10 that will give you a further penetration. Whereas, if  
11 you are flailing with your arms out from the side of  
12 your body, that will slow your penetration.

13 Q. Now, turning next to factors relevant on the night, we  
14 have heard evidence that the tidal flow was relatively  
15 slack, so that there was not a heavy flow of tide away  
16 from the bridge; you understand that?

17 A. I do, sir.

18 Q. We also understand that there was relatively little  
19 marine traffic in the area and that a short time into  
20 the search, the river area around was closed?

21 A. That's true, sir.

22 Q. What other characteristics of the river in the area of  
23 London Bridge would be relevant to any search for Xavier  
24 and, therefore, any assessment of what happened to him?

25 A. London Bridge is one of the few bridges that is

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1 routinely lit at night, and that does assist surface  
 2 searching. We suffer in other places with a very  
 3 inky-black Thames and very brightly lit embankments,  
 4 whereas London Bridge is kind in the sense the bridge is  
 5 already lit in quite a pleasant orange light for working  
 6 at night. The embankments around are not overly lit,  
 7 and therefore it gives you a sensible contrast medium to  
 8 be able to see the water and see the water surface. We  
 9 also assist that using night vision equipment as  
 10 required.

11 Also, ever since the Marchioness disaster they put  
 12 chains on the bridges at three different tide heights to  
 13 allow people to self-rescue and therefore victims can  
 14 grasp these chains and loop themselves into them with  
 15 their arms, for example, and also in that area, unlike  
 16 other areas of the Thames, there are steps out,  
 17 associated around a couple of public houses either side,  
 18 that people can actually enter the water and effectively  
 19 self-rescue in that zone as well.

20 Q. The evidence that we have received is that search  
 21 vessels arrived around 7 or so minutes after  
 22 Monsieur Thomas entered the water, that they performed  
 23 a hasty or immediate search around the area where he  
 24 fell and saw no sign of him. Also some, such as  
 25 Ms Holly Jones on the bridge, looked over to see if they

1 could see anyone in the water and couldn't see anyone,  
 2 or didn't see anyone, and that there were then searches  
 3 involving passes up and down the river for some time  
 4 afterwards; I think you are aware of all of those  
 5 efforts.

6 A. Yes, the standard approach for a bridge jumper, the  
 7 concept of a hasty search is to cover the ground at  
 8 speed for anyone on the surface. It's very well done,  
 9 it's very well proven, and it is carried out  
 10 unfortunately too many times in central London, but it  
 11 is the arrival of a hasty search normally is guaranteed  
 12 to pick up the patient on the surface.

13 If, however, you then detect no patient on the  
 14 surface, all vessels concerned will form a structured  
 15 slow search, where normally in this case line abreast,  
 16 and by line abreast we mean vessels stemming the Thames  
 17 and we look at the conditions on the night to decide the  
 18 search width between our vessels, because you have to be  
 19 able to accurately clear the water.

20 To give you a concept of what that's like, in a boat  
 21 search in the River Thames in that sort of reach, you  
 22 would be looking at no more than myself to the far side  
 23 of the courtroom as your search duration on either side  
 24 of the boat to allow you to effectively cover that water  
 25 distance.

1 Q. Thank you.

2 Now, some information from the collision  
 3 investigation work by PC Andrews, which we heard  
 4 yesterday, PC Andrews informed us that it would be --  
 5 that it's likely that Xavier Thomas was struck on the  
 6 legs and scooped up over the parapet of the bridge. He  
 7 also gave evidence that it's likely that Monsieur Thomas  
 8 entered the water at a speed of approximately 36 miles  
 9 per hour.

10 I think you're also aware of the basic conclusions  
 11 of Dr Lockyer's post mortem examination report, namely  
 12 as follows: first of all, there were no substantial  
 13 signs of submersion drowning, such as heavy and  
 14 waterlogged lungs; no musculoskeletal injury, such as to  
 15 prevent swimming; no high cervical spine injury, and no  
 16 evidence of significant head injury.

17 Bearing in mind all the factors that we have just  
 18 been through, I'd like to ask you about a series of  
 19 scenarios. You identified the 11 scenarios to be  
 20 considered, and you rule out some of them and identify  
 21 one as most likely.

22 May I ask you to deal with them one by one. First  
 23 of all, the scenario you described as "Drowning after  
 24 a period of surface time". Can you shortly tell us what  
 25 that scenario would have involved and what your view of

1 it is?

2 A. So the first scenario in my report I've called  
 3 scenario A would be that Mr Thomas would have entered  
 4 the river, made the surface, continued on the surface to  
 5 tread water until peripheral swim failure rendered him  
 6 unable to stay on the surface of the water, at which  
 7 point in the absence of buoyancy he would have gone  
 8 subsurface, leading to submersion drowning.

9 I do believe this can be ruled out by several  
 10 factors, one of which is the lack of post mortem  
 11 drowning evidence, and we would be convinced that if  
 12 Mr Thomas was in a position to support himself above the  
 13 water, he would have been in a position to seek aid and  
 14 either self-rescue or make his presence aware to the  
 15 rescuers to detect him. And the lack of any  
 16 musculoskeletal injuries on post mortem would indicate  
 17 that there would be no reason why he couldn't have kept  
 18 himself above the water and, therefore, all those  
 19 factors I do believe rule out that he was on the surface  
 20 of the water for a period of time and then proceeded to  
 21 drown.

22 Q. Second, your scenario B you term "Drowning as unable to  
 23 stay afloat"; can you summarise that scenario and why  
 24 you have ruled that out too?

25 A. Again, the concept that Mr Thomas arrived in the water

1 but then reached the surface but then as some casualties  
 2 sadly are unable to stay on the surface because they  
 3 cannot, in the absence of a lifejacket, where they are  
 4 relying on their limbs to stay buoyant by kicking or  
 5 treading water or swimming or gripping to a structure,  
 6 that way they cannot stay on the surface and they  
 7 proceed to a submersion drowning and I believe again we  
 8 can rule that out because of the lack of post mortem  
 9 drowning and the lack of musculoskeletal injuries.

10 Q. Your third scenario you summarise as "Drowning because  
 11 unable to surface from a depth in the water". Can you  
 12 say what that involves or would involve and why that too  
 13 can be discounted?

14 A. This is the thought process that had Mr Thomas entered  
 15 the water near vertical and penetrated past the 5-metre  
 16 depth and then continued to sink, yet be unable to  
 17 strike to the surface. Now that would be the case if,  
 18 again, you had musculoskeletal injuries or any  
 19 significant head injury, neither of which were present,  
 20 to strike to the surface, and again, would have let to  
 21 the post mortem findings of submersion drowning which  
 22 weren't present.

23 Q. Your fourth scenario on page 10 you describe as  
 24 "Drowning face-down on the surface after a brain  
 25 injury". What would that involve in terms of mechanism

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1 and why do you discount that also?

2 A. Had the impact of the vehicle or the impact with any  
 3 part of the bridge caused a catastrophic head injury  
 4 rendering Mr Thomas unconscious, then he could have  
 5 arrived in the water, let's -- again, the hypothesis  
 6 that he arrived in the water near horizontal, surfaced  
 7 where he would have been face-down. Again, a face-down  
 8 patient in the water like this would have submersion  
 9 drowned, and we do not have the evidence of that. And,  
 10 with the conditions on the river that night, even  
 11 a face-down surface patient we would have expected to  
 12 have found.

13 Q. So those, again, independent and separate reasons why  
 14 you can discount that process?

15 A. I believe so, certainly, yes.

16 Q. Your scenario F next, "Death on the surface due to cold  
 17 water shock response", and this involves some of the  
 18 physiological processes you were describing earlier.  
 19 Once again, can you summarise what this scenario would  
 20 involve and why you discount it too?

21 A. So the idea that, again, Mr Thomas might have arrived in  
 22 the water nearer the horizontal plane, been on the  
 23 surface and suffered either the respiratory effects or  
 24 the cardiac effects of the cold shock response. We can  
 25 rule out the respiratory effects in the absence of the

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1 drowning and I do believe, again, had he been on the  
 2 surface the high likelihood of detection coupled with  
 3 the water temperature of 20 degrees is not in the --  
 4 it's towards the top end of the responses of cold shock,  
 5 I said to you earlier that cold shock starts, that it is  
 6 very minor in 25 degrees C, building to 10 as its real  
 7 highest effects with the effect curve really starting to  
 8 peak at 17. So at 20 degrees C we're not expecting  
 9 catastrophic cold shock effects.

10 Q. So if Xavier was initially on the surface, it is  
 11 unlikely that the cold shock response was fatal, is this  
 12 right, because first of all, it wouldn't have been fatal  
 13 through the respiratory effects because that would have  
 14 resulted in the post mortem findings of heavy lungs?

15 A. Correct.

16 Q. It's very unlikely that it was fatal through the cardiac  
 17 effects because it is unlikely that a cold shock  
 18 response alone at this surface level would have had that  
 19 effect, given this temperature on somebody of  
 20 Monsieur Thomas' age and characteristics?

21 A. I believe that the better term for that would be, sir,  
 22 unlikely. It is less likely. We can't 100% rule out  
 23 cold shock at 20 degrees, but it is far less likely than  
 24 anything else, and the reason why scenario F is removed  
 25 is because, again, it would render your patient on the

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1 surface, near surface and able to be detected.

2 Q. So it's physiologically unlikely and it's made very  
 3 unlikely when one adds to that the fact that he would  
 4 likely have been visible on the surface of the water?

5 A. Correct, sir.

6 Q. Your scenario G, please, you term "Death subsurface due  
 7 to the cold shock response". Is this a variant of the  
 8 scenario you were describing earlier for which you have  
 9 a slightly different view?

10 A. Yes, so this is why my answer to you a second ago was  
 11 it's less likely, because this is the situation where  
 12 Mr Thomas has entered in a more vertical plane,  
 13 potentially penetrating past the 5-metre point, having  
 14 a cold shock reaction but that cold shock reaction being  
 15 purely the cardiac side, not the respiratory side,  
 16 because we know there is no post mortem evidence of the  
 17 respiratory side. So that's why we cannot completely  
 18 rule out the cold shock response. There is a chance,  
 19 but the water temperature is at the temperature where it  
 20 would be less likely.

21 Q. This is the first scenario you have considered a serious  
 22 possibility. It would have involved Xavier going into  
 23 the water near vertically, and going some distance below  
 24 the water, and then would have involved the cold shock  
 25 response having a fatal cardiac arrhythmic effect that

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1 wouldn't show up on post mortem?

2 A. Correct, sir, and I think it's probably worth me saying

3 that the higher the fall, the more it gives the person

4 the opportunity to change their position in air, and by

5 that I mean if you are falling just a couple of metres

6 you tend to fall however you fall, whereas if you are

7 falling 13 metres, you do have probably 6 to 7 seconds

8 to change your potential position on arrival to the

9 water.

10 Q. Thank you.

11 Your scenario H next involves the phenomenon of

12 autonomic conflict, which you explained to us earlier,

13 the two conflicting impulses of the sympathetic and

14 parasympathetic autonomic systems.

15 Can you describe first of all this scenario: death

16 on the surface due to autonomic conflict and your view

17 of that?

18 A. There is a chance, again, autonomic conflict comes down

19 to one of the possibilities of the reason for Mr Thomas'

20 death. However, again, it comes back to the point --

21 20 degrees C is less likely to have produced the cold

22 shock response which then the wet face applies the

23 autonomic conflict response on top.

24 There is the possibility, because autonomic conflict

25 is caused by an aggression in your sympathetic nervous

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1 system, there is the possibility that fear could do

2 that, and therefore there is the possibility that the --

3 you can imagine during the actual moment of the attack

4 you will have your fight or flight reflex activated. So

5 there is the possibility that, as well as the potential

6 for the cold water, the actual attack itself could be

7 the stimulant for the sympathetic side of that nervous

8 system and then the wet face applying the

9 parasympathetic stimulation to create a cold shock

10 response.

11 However, if I may take H and I together, again,

12 I rule out H because we do not believe the likelihood of

13 Mr Thomas being on the surface, whereas I, death by

14 autonomic conflict at depth, is one of the possibilities

15 considered, however, again, reduced in its likelihood by

16 the water temperature.

17 Q. So just to go back over that, and put it, I hope, as

18 simply as we can, autonomic conflict could have been

19 a mechanism of death?

20 A. Yes.

21 Q. You think it is unlikely to have occurred following

22 Monsieur Thomas coming to rest on the surface because of

23 the possibility of detection on the surface?

24 A. Correct.

25 Q. You consider it is more possible that death occurred by

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1 that process subsurface because there wouldn't have been

2 a chance of detection?

3 A. Correct.

4 Q. But there are points against it from a physiological

5 point of view, first of all, that the water temperature

6 is unlikely to have caused a conflict sufficient to be

7 fatal?

8 A. It's at the upper end of that temperature scale, yes,

9 sir.

10 Q. And also because this is a phenomenon which poses more

11 of a risk to people with a known cardiac pathology?

12 A. Correct.

13 Q. But, once again, as with arrhythmia due to cold water

14 shock below surface, you can't entirely rule this out

15 because there may have been this process which wouldn't

16 have shown up in post mortem findings?

17 A. That is correct.

18 Q. The next two scenarios, and the final two scenarios you

19 consider, involve impact brain apnoea. Can you explain

20 what that process is before you take us to the two

21 scenarios?

22 A. Impact brain apnoea is a condition, like autonomic

23 conflict, which is incredibly new in its discovery.

24 Autonomic conflict we're talking 2012, impact brain

25 apnoea, we're talking about the first research papers

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1 being 2016. So it is a phenomenon again which is not

2 fully understood, and I think that's something we must

3 really outline.

4 A lot of the studies into impact brain apnoea have

5 been anecdotal from clinicians on the scene and the

6 remaining studies have tended to be animal models, and

7 it is still being actively, currently researched. But

8 impact brain apnoea is where the head receives an insult

9 in such a way that it causes the body to cease

10 respiratory effort. So after a direct blow to the head,

11 the patient stops breathing. This isn't usually

12 self-limiting in that if it isn't treated, the patient

13 maintains their inability to breathe and then goes on to

14 what we call a hypoxic cardiac arrest, which is a stop

15 of the heartbeat, courtesy of lack of oxygen. The same

16 methodology, if you like, as the final end result of any

17 suffocation to the patient.

18 Impact brain apnoea has been noticed primarily at

19 motorcycle accidents with high impact to the head, and

20 also in some sports fields, and the current research is

21 pointing towards different places where it could occur,

22 and therefore, I do not think we can rule out impact

23 brain apnoea when a person falls 13 metres into water,

24 but for it to happen, they would have to fall head-first

25 into water, not feet-first.

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1 Q. So to summarise there, a person falling from a height  
 2 such as that from which Xavier Thomas fell, if falling  
 3 head-first, could strike the water with sufficient force  
 4 to induce this condition of impact brain apnoea simply  
 5 through the force to the head?  
 6 A. With our current understanding of the situation, that's  
 7 correct.  
 8 Q. And that process resulting from the physical force to  
 9 the head and to the brain would be sufficient to stop  
 10 the breathing in the immediate aftermath?  
 11 A. Correct, and that cessation of breathing continues  
 12 unless the patient is actively treated.  
 13 Q. Would there be any clinical sign at post mortem  
 14 examination that this is what had happened?  
 15 A. They do believe that the majority of clinical signs of  
 16 impact brain apnoea are masked with the general  
 17 degradation of the brain post mortem, and therefore it  
 18 is incredibly difficult to pull the pre and post mortem  
 19 findings apart, so there is no definitive sign of it  
 20 currently understood at post mortem.  
 21 Q. Are there any signs which may, while not being  
 22 definitive, be indicative or supportive of a finding of  
 23 impact brain apnoea?  
 24 A. General hypoxic brain tissue might be an indication of  
 25 impact brain apnoea, but it's therefore difficult to

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1 prove whether that is pre or post mortem.  
 2 Q. Just to be clear about the both immediate and longer  
 3 term effects, would the effect of the shock, the apnoeic  
 4 effect, stopping breathing, wear off naturally?  
 5 A. Unlikely. At the moment the studies -- there is  
 6 anecdotal evidence of a few cases, but the bulk of the  
 7 medical evidence is that it doesn't wear off; it  
 8 requires active ventilation of the patient. By  
 9 ventilation I mean artificial respiration with a device  
 10 to assist it wearing off.  
 11 Q. Can this happen -- could this happen to a relatively  
 12 young and fit person like Mr Thomas?  
 13 A. Absolutely.  
 14 Q. Are there any physical characteristics of a person that  
 15 make them more or less vulnerable to this effect?  
 16 A. No.  
 17 Q. Did you consider it your tenth scenario, scenario J,  
 18 death on the surface of the water due to this phenomenon  
 19 of impact brain apnoea?  
 20 A. Again, I believe there is a chance, and all of this, as  
 21 I'm sure you're aware, is supposition and trying to put  
 22 pieces of evidence together to give you the best opinion  
 23 that we can, there is a chance that impact brain apnoea  
 24 was the cause. However, again, we ruled out the surface  
 25 because we strongly believe had he been on the surface,

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1 he would have been located.  
 2 Q. Considering the final scenario, scenario K, "Death  
 3 subsurface due to impact brain apnoea", how do you  
 4 consider that as a candidate cause or mechanism of death  
 5 by comparison to the various other scenarios?  
 6 A. If we believe this to be the case, that Mr Thomas, with  
 7 a 13-metre fall, had the ability to change a body  
 8 position to potentially enter head-first, from 13 metres  
 9 entering the near vertical head-first, that impact on  
 10 the head and brain theoretically has the ability to  
 11 produce impact brain apnoea, coupled with the near  
 12 heading towards a vertical entry allows the penetration  
 13 below 5 metres. You then have a patient sinking below  
 14 5 metres, not breathing, apnoeic, in an unrecoverable  
 15 state that will lead on to, then, a hypoxic cardiac  
 16 arrest.  
 17 With those findings, there being no respiratory  
 18 effort, there are therefore no signs of submersion  
 19 drowning, and with the potential for post mortem hypoxic  
 20 brain injury masking any pre mortem brain injury, makes  
 21 it virtually undetectable at post mortem.  
 22 Q. Drawing the threads together of your evidence, can we  
 23 say in summary that when death occurs due to immersion  
 24 in water without the characteristic findings of  
 25 submersion drowning, there can often be challenges in

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1 determining the mechanism of death?  
 2 A. I think that's a very accurate statement. Most of the  
 3 time post mortems of this nature are inconclusive  
 4 because the majority of the evidence sadly dies with the  
 5 patient.  
 6 Q. You are prepared to accept as possible mechanisms of  
 7 death an arrhythmia due to autonomic conflict,  
 8 an arrhythmia due to cold shock, or a hypoxic cardiac  
 9 arrest due to impact brain apnoea?  
 10 A. Yes, sir.  
 11 Q. Is any of those processes physiologically more or less  
 12 likely than any of the others as mechanism of death?  
 13 A. I believe that with the higher water temperature -- we  
 14 cannot be certain, but my best opinion to you is that  
 15 with the higher water temperature on the night, the  
 16 likelihood of the cold shock and the likelihood of  
 17 autonomic conflict are reduced, leaving the more likely  
 18 to be the impact brain apnoea, stressing that two of  
 19 those conditions are still at the research phase of  
 20 understanding.  
 21 Q. As to where death occurred by any of those processes,  
 22 you formed a view that it was likely subsurface, is this  
 23 right, that you based that on the assessment that had  
 24 Monsieur Thomas remained above surface for any  
 25 significant period, he would have been seen either by

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1 those on the bridge or those coming to search for him?  
 2 A. Exactly, sir.  
 3 Q. But is this right: you are unable, beyond those  
 4 conclusions, to say "Here is one cause that I can say is  
 5 more probable than not"?  
 6 A. Exactly as you've described, yes.  
 7 MR HOUGH: Thank you very much. Those are all my questions.  
 8 There will be some more.  
 9 A. Thank you.  
 10 Questions by MR ADAMSON  
 11 MR ADAMSON: Mr Savage, my name is Dominic Adamson and I ask  
 12 questions on behalf of the parents of Xavier Thomas, and  
 13 his partner, Christine Delcros.  
 14 I'm going to start, if I may, by just dealing with  
 15 some of your broader themes before turning to your  
 16 scenarios, and I want to start by looking at submersion  
 17 drowning and what you might expect to find.  
 18 You would accept, would you, that drowning is  
 19 a diagnosis of exclusion?  
 20 A. Yes.  
 21 Q. And so the fact that there are no signs of submersion  
 22 drowning does not mean that it did not happen?  
 23 A. I have to answer that within the boundaries of not being  
 24 a pathologist, being a pre-hospital clinician, that  
 25 I don't examine dead bodies. With the elements of

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1 submersion/immersion, trying to pick them apart at post  
 2 mortem, my understanding is it is an incredibly  
 3 difficult task.  
 4 Q. Yes. Let me read to you what Dr Lockyer said in his  
 5 conclusions to his post mortem report:  
 6 "Drowning is a difficult post mortem diagnosis to  
 7 make with certainty, often considered to be a diagnosis  
 8 of exclusion."  
 9 You agree with that?  
 10 A. Yes.  
 11 Q. "Probably the most characteristic findings at autopsy in  
 12 cases of drowning are frothy liquid in the air  
 13 passages ..."  
 14 And you have referred to that, haven't you?  
 15 "... sometimes emanating from the nose and mouth,  
 16 and heavy expanded crepitant oedematous lungs. However,  
 17 these findings are not always present and are not  
 18 entirely specific to drowning, sometimes seen in cases  
 19 of drug overdose and congestive heart failure."  
 20 Well neither of those play a part here. But the  
 21 point that is made by Dr Lockyer is that they're not  
 22 always present.  
 23 A. Yes.  
 24 Q. Even in those cases where that is the mechanism of  
 25 death.

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1 A. And some people would say that the reason is that  
 2 currently the mechanisms of submersion and immersion are  
 3 not fully understood by all, which is why I point you  
 4 towards the current ongoing research, and it's  
 5 incredibly hard for any professional to put their finger  
 6 exactly on what has happened to the patient.  
 7 Q. If it's difficult, and if it's to make a diagnosis with  
 8 certainty, and the characteristics described are not  
 9 always present, it would not be safe, would it, to  
 10 exclude a particular scenario for that reason?  
 11 A. I think, rather than exclude, I think the term "less  
 12 likely on the balance of opinion" may be a better term.  
 13 Q. I see. So where you say in the conclusion to your  
 14 report "The absence of significant post mortem evidence  
 15 of drowning allows ..." and then you identify the  
 16 scenarios to be reasonably discounted, that has to be  
 17 caveatted, doesn't it, that even in those cases where  
 18 a person has drowned, there will not always be the signs  
 19 present?  
 20 A. I don't disagree with you, sir. I would be interested  
 21 to see if there were pathologists who could put stats to  
 22 that. By that I mean it would be very interesting to  
 23 know if they believe that, you know, it was absent in  
 24 10%, 20%, but I do not know those figures as  
 25 a pathologist, because I am not.

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1 Q. Second topic. Adequacy of the search on the night of  
 2 the attack. You say in your conclusion:  
 3 "Accepting the certainty of the experienced  
 4 responding lifeboat crew of the night that had he been  
 5 on the surface he would have been detected ..."  
 6 You then identify various scenarios that can be  
 7 reasonably discounted, and in other words, I think what  
 8 you're saying is that had he been there on the surface  
 9 to be seen, he would have been and he would have been  
 10 saved; is that right?  
 11 A. That's my understanding, sir, yes.  
 12 Q. Yes. We heard during your evidence when you were  
 13 commenting on a number of the scenarios you used the  
 14 term "we strongly believe that he would have been  
 15 found." You are a serving member of the RNLI; is that  
 16 right?  
 17 A. I am, sir, yes.  
 18 Q. And, in fact, you are based at the station that the  
 19 operatives on -- who were working on the night are based  
 20 at too; is that right?  
 21 A. Yes, sir, yes.  
 22 Q. So you know the people who were involved on the night?  
 23 A. Yes.  
 24 Q. But you weren't serving on that particular occasion?  
 25 A. No.

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1 Q. Now, you're not here in your capacity as  
 2 a representative of that lifeboat station; you're here  
 3 as an independent expert. We know that Xavier entered  
 4 the water at 22.07 and that the first patrol boat, which  
 5 was a marine patrol boat, arrived about 7 minutes later,  
 6 and the RNLI boats arrived about 13 minutes later, and  
 7 we know that a structured search, a line search, to  
 8 which you've referred, didn't commence until 18 minutes  
 9 later.  
 10 In relation to your scenarios, how long would  
 11 somebody who fell into the water not in the horizontal,  
 12 but was in some way rendered unconscious or unable to  
 13 breathe in those circumstances, but did not penetrate  
 14 below the surface, be likely to remain on the surface?  
 15 A. A human -- I believe what you're asking me is how long,  
 16 potentially, does a human being stay on the surface  
 17 prior to waterlogging?  
 18 Q. Yes.  
 19 A. There is no definitive data, but anecdotally you are  
 20 looking at several hours in the surface to immediate  
 21 subsurface zone, and by immediate subsurface it is what  
 22 I have been talking about, the 1 to 2 feet.  
 23 Q. 1 to 2 feet?  
 24 A. Yes.  
 25 Q. So your understanding is that in the period that we're

1 talking about for this particular search, we know that  
 2 the search was called off after 47 minutes. But, on the  
 3 basis of your answer, it would seem that it's certainly  
 4 possible for some time after that that a person could  
 5 still be floating in the water?  
 6 A. Yes.  
 7 Q. And visible?  
 8 A. Yes.  
 9 Q. And in terms of what might be capable of being seen, it  
 10 could be just the back of the head?  
 11 A. Yes.  
 12 Q. Or it could be what you've described as a pillow-type  
 13 effect?  
 14 A. Yes.  
 15 Q. In terms of how easy it is to spot those in the River  
 16 Thames, is it difficult or is it straightforward?  
 17 A. It depends on many factors. It depends on light, it  
 18 depends on the amount of traffic on the river, it  
 19 depends on the ambient lighting of the banks, it also  
 20 depends on the tide state, because the more aggressive  
 21 the tide state, the bigger your search area is.  
 22 My understanding of the night is that we were almost  
 23 at slack water, by slack water I mean very little tide  
 24 movement.  
 25 Q. The evidence that we've heard is it was about half

1 a knot.  
 2 A. Therefore that is half a mile in an hour, which is not  
 3 the world's biggest distance when you think about  
 4 a search pattern, and when you think how, actually, the  
 5 River Thames is very narrow at that position, you are  
 6 only looking at a river that's probably three times the  
 7 width of this courtroom, three to four times the width  
 8 of this courtroom by London Bridge.  
 9 THE CHIEF CORONER: I've probably got a plan somewhere. No,  
 10 if we work --  
 11 A. This is about the span of an arch and we've got four to  
 12 five arches, so maybe if you wanted to be, not generous,  
 13 let's say six times the width of this courtroom, and  
 14 I don't know the intimate details of that night because  
 15 I've deliberately tried to stay away from the RNLI side  
 16 of it, however, my understanding is you have at least  
 17 three, if not four vessels searching that area, with  
 18 very limited tide, meaning the search area you have to  
 19 cover is very small and you have a lot of eyes and a lot  
 20 of vessels to cover that area.  
 21 MR ADAMSON: Yes. You don't know the intimate details of  
 22 the search on that night. We've heard that two marine  
 23 police units were also engaged in warding people away  
 24 from what I've described as the danger area, and so it's  
 25 not really for you to make a decision as to whether or

1 not the search was adequate or not, or whether it was  
 2 effective or not; is that fair to say?  
 3 A. That's very fair to say.  
 4 Q. Yes. And so if there were aspects of the search which  
 5 were not as effective as they could have been, that  
 6 would reduce your confidence in discounting scenarios  
 7 where the certainty of locating Xavier has been applied  
 8 in your analysis; is that fair?  
 9 A. My scenarios come from over 30 years of taking people  
 10 out of water and searching for people in water and  
 11 removing them from water, and the understanding of how  
 12 many times, if the patient is on the surface, they are  
 13 found, and the ones that aren't found tend to be the  
 14 ones that aren't on the surface.  
 15 So those -- that comes from experience, is the only  
 16 way I can put that, sir.  
 17 Q. But it wouldn't be safe to say that an experienced  
 18 lifeboat crew would be certain to find it, would it?  
 19 A. Not 100 per cent certainty.  
 20 Q. Because they may not have done things in the way they  
 21 ought to, they may not have been as effective as they  
 22 are on other occasions?  
 23 A. I can't say, sir, I wasn't there.  
 24 Q. In terms of the -- next topic -- the angle of entry, you  
 25 can't say one way or another whether he entered in the

1 vertical or the horizontal; is that right?  
 2 A. Correct.  
 3 Q. Or somewhere in between?  
 4 A. In between.  
 5 Q. I think it was in connection with your analysis of  
 6 impact brain apnoea that you said that that required  
 7 vertical entry; is that right?  
 8 A. Yes, vertical entry to penetrate to depth. It requires  
 9 a significant strike to the head.  
 10 Q. Yes. And you've concluded that of all the scenarios,  
 11 an impact brain apnoea is the one that you favour?  
 12 A. Only based on the elimination courtesy of water  
 13 temperature. But I think it has to be fair to say we  
 14 have no certainty of anything that happened to Mr Thomas  
 15 and all I've tried to do here is look at the evidence  
 16 that's been presented to me and systemically go through  
 17 the options and see which ones present a likelihood or  
 18 not for you, sir.  
 19 Q. I mean, you have made the point there was evidence of  
 20 a blunt force injury to the nose, which you speculated  
 21 might have been caused at point of entry to the water.  
 22 We also know that there was bruising to the arms and the  
 23 left leg. Now, I appreciate that, again, one can't be  
 24 certain because the evidence indicates that he was  
 25 probably struck by the vehicle too. But let us take the

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1 arms, for example. Could the arms have been bruised by  
 2 entry into the water from a fall from that height?  
 3 A. I believe they could have been bruised by impact with  
 4 the vehicle, impact with the bridge parapet or impact  
 5 with the water. I'm not sure you could eliminate any.  
 6 Q. So the physical findings in that respect don't really  
 7 assist us in determining whether there is horizontal or  
 8 vertical entry?  
 9 A. No.  
 10 Q. Just in terms of your analysis of the distance he fell,  
 11 you've observed that he fell 13 metres, and you thought  
 12 that that sort of fall would have given Mr Xavier Thomas  
 13 the opportunity to correct his angle as he was falling,  
 14 so as to essentially, as I understand it, enter the  
 15 water in a more convenient dive-like pose; is that  
 16 right?  
 17 A. It has the potential to do so, yes.  
 18 Q. Yes. You thought that the fall time might be about 6 or  
 19 7 seconds?  
 20 A. Based on, we know that fall times from 5 metres are in  
 21 the region of around about the 2-second point. Just  
 22 extrapolating that up, it all depends on the speed that  
 23 Mr Thomas left the bridge and body weight, but you're  
 24 looking at that sort of neck of the woods.  
 25 Q. Yes. We heard some evidence about gravity yesterday and

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1 its effect. An object falls at 9.8 metres per second  
 2 squared, which means that in the first second, an object  
 3 would fall 9.8 metres, or half of 9.8 metres, ie  
 4 4.9 metres. In the first two seconds, it will fall, as  
 5 I understand it, 19.6 metres.  
 6 A. Okay.  
 7 Q. So, in fact, the fall time is rather shorter.  
 8 A. I don't disagree with you, sir --  
 9 THE CHIEF CORONER: Isn't that its terminal velocity rather  
 10 than its initial velocity?  
 11 MR ADAMSON: Ah, maybe I've got it wrong, then.  
 12 A. And also we don't know how high Mr Thomas was ejected  
 13 above the surface height of the bridge. We have the  
 14 height of the bridge because it is a geographical  
 15 structure, but nobody can say how high the van lifted  
 16 Mr Thomas before he made his descent which might add to  
 17 the actual fall height as well.  
 18 THE CHIEF CORONER: My recollection, Mr Adamson, and do  
 19 correct me because I don't always get these things  
 20 right, was the example that was given was about the one  
 21 which we're all familiar with, the tonne of lead and the  
 22 feathers. They all reach their terminal velocity, but  
 23 it's getting there.  
 24 MR ADAMSON: Yes, I'll move on.  
 25 MR HOUGH: I think, in fairness to Mr Adamson, looking at

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1 appendix 3 of Mr Andrews' report, it was the standard  
 2 fall speed of a vehicle, 9.81 metres per second squared,  
 3 which was used in the calculation rather than that being  
 4 the terminal velocity.  
 5 MR ADAMSON: I'm not sure where that leaves us in terms  
 6 of --  
 7 THE CHIEF CORONER: I think Mr Hough is quite rightly saying  
 8 you were correct in your proposition.  
 9 MR ADAMSON: Next topic. So far as the temperature of the  
 10 water is concerned, 20 degrees Celsius, you're satisfied  
 11 that that's the sort of temperature of the Thames at  
 12 this time of year -- at this time of year, because we're  
 13 almost two years out.  
 14 A. The data was supplied to me that the temperature of the  
 15 Thames that night was -- they had -- the information  
 16 graph showed the temperature at various locations and  
 17 there was a degree difference and they met the mean, so  
 18 they've come to that conclusion of 20 degrees C.  
 19 Q. Yes. Now, just turning to the physiological effects on  
 20 the body of falling and of a few questions on that if  
 21 I may. Turning to cold shock response first, you said  
 22 in section 2 of your report that at temperatures of  
 23 25 degrees centigrade, it's possible, but there's no  
 24 significant effect until the water is 17 degrees; is  
 25 that right?

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1 A. It's a sliding scale that starts at 25 degrees C and  
 2 reaches a maximum of 10 degrees C. Therefore there are  
 3 some effects at 20 degrees C but they are not as  
 4 aggressive as the effects at 17 or 10.  
 5 Q. Would clothes reduce the likelihood of cold water shock?  
 6 A. It depends very much on the nature of the clothes.  
 7 We describe clothing as flush clothing or non-flush  
 8 clothing. Cold shock is stimulated by the ability for  
 9 your skin to get wet simultaneously, therefore normal  
 10 civilian clothes are not a guard against cold shock  
 11 because water can draw into, up your sleeves, in your  
 12 shirt, et cetera. Whereas if, for example, you are in  
 13 an immersion or drysuit or a wetsuit they become more  
 14 cold shock protective.  
 15 Q. So on the night Mr Thomas was wearing jeans and a coat;  
 16 would those be the sort of clothes that would have any  
 17 impact, in your view?  
 18 A. I do not believe they would significantly reduce the  
 19 likelihood of cold shock.  
 20 Q. Now in your report you've put the period 3 to 5 minutes  
 21 for cold shock. Do I understand that to mean that for  
 22 a period of 3 to 5 minutes that phenomenon is present?  
 23 A. I need to correct that. That's a mistake in my report.  
 24 It's 0 to 3 minutes, I do beg your pardon. 0 to 3  
 25 minutes is the cold shock response. 3 minutes is the

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1 border where it starts to clear.  
 2 Q. Right.  
 3 THE CHIEF CORONER: I think that was clear from other  
 4 evidence you gave about the effect wearing off after  
 5 3 minutes.  
 6 A. Yes. I do apologise; that's a mistake in the report.  
 7 MR ADAMSON: So far as the respiratory gasp is concerned,  
 8 you talked about the inhalation of the water caused by  
 9 the respiratory gasp and you talked about how the water  
 10 within the lungs would then either remain or pass  
 11 through into the bloodstream and, as I understood your  
 12 evidence, it made a difference whether it was saltwater  
 13 or non-saltwater --  
 14 A. Yes.  
 15 Q. -- is that right?  
 16 A. That's correct.  
 17 Q. This part of the Thames, the water is ...?  
 18 A. The general belief is that it's salt up to Blackfriars  
 19 Bridge and fresh from Blackfriars Bridge north. So here  
 20 we're talking salt, if you believe the general belief of  
 21 the Thames.  
 22 Q. And so you would expect, then, that water to remain on  
 23 the lungs, rather than pass into the body?  
 24 A. Yes.  
 25 Q. You have addressed the cardiovascular elements of it.

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1 I don't have any particular questions in relation to  
 2 that. I do have some questions in relation to  
 3 hypothermia and peripheral cooling. Now, you have ruled  
 4 those both out as potential explanations in this  
 5 instance but, again, these are phenomenon that take  
 6 a considerable period of time to occur; is that right?  
 7 A. That's correct.  
 8 Q. And so far as peripheral cooling is concerned, do  
 9 I understand your evidence correctly that it would take  
 10 about 30 minutes for the effects of peripheral cooling  
 11 to have an effect?  
 12 A. Peripheral cooling is directly based on water  
 13 temperature, so at the colder water temperatures  
 14 we expect peripheral cooling failure between the 3 to  
 15 30-minute mark, but at 20 degrees C, which is a coastal  
 16 swimming temperature in the summer, you would expect  
 17 peripheral cooling to not become disabling within the  
 18 sub one hour. You're still going to have effects from  
 19 peripheral cooling as it rises past that time period,  
 20 but peripheral cooling is a sustained period of time in  
 21 the water.  
 22 Q. And hypothermia even longer, and I think you have given  
 23 a figure of 40 hours.  
 24 A. That's the very, very maximum time where, at that point  
 25 in time, all patients are known to not survive. If you

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1 look at 20 degrees C and you're looking at sort of 50%  
 2 survival times, you would still be looking in the 4 to  
 3 5 hours, but that's what I want to stress: it's hours,  
 4 not minutes, for hypothermia.  
 5 Q. Again, you are describing potential methods of death  
 6 which take a prolonged period of time --  
 7 A. Yes.  
 8 Q. -- to occur, and so here a search is called off after  
 9 47 minutes and we have two mechanisms of death which  
 10 would not have taken place within that time frame; is  
 11 that fair to say?  
 12 A. That's a fair comment.  
 13 Q. Turning to surface or subsurface, your evidence is that  
 14 he is likely to have penetrated below 5 metres on entry?  
 15 A. There is the potential for a 13-metre fall to do that,  
 16 yes.  
 17 Q. But you can't -- sorry, "likely" is the wrong word: it's  
 18 "possible", rather than "likely"?  
 19 A. Yes.  
 20 Q. Any impact with the water which is not horizontal is  
 21 likely to have left him at some point between 5 metres  
 22 and at surface level?  
 23 A. Yes.  
 24 Q. And if he entered in the horizontal, he would have  
 25 remained roughly at about the surface level for a period

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1 of time?  
 2 A. When we say surface level, I think we need to clarify,  
 3 and by that I mean a human being dead, incapacitated,  
 4 whichever term you would like to use, in the water, as  
 5 we went back either based on clothing, body mass,  
 6 structure, body fat, muscle, et cetera, will float  
 7 anywhere between the surface and 1 to 2-foot subsurface.  
 8 If you, for example, look at the lady ejected off of  
 9 Westminster Bridge during that attack, she was  
 10 subsurface throughout that rescue.  
 11 So you can't define that people will always be on  
 12 the surface. By that you mean they might be, you know,  
 13 just a foot under, 2-foot under, but the immediate body  
 14 in water doesn't sink off to the deep unless there's  
 15 a reason to do so.  
 16 THE CHIEF CORONER: Mr Adamson, I've got something I need to  
 17 do in about 2 or 3 minutes' time. I don't want to rush  
 18 your questions.  
 19 MR ADAMSON: I am afraid I'm not going to be finished in  
 20 2 or 3 minutes.  
 21 THE CHIEF CORONER: That's not a problem at all. I just  
 22 thought whether that's a convenient moment to break off?  
 23 MR ADAMSON: I appreciate that we all thought it might be  
 24 possible to --  
 25 THE CHIEF CORONER: No, there's no problem at all. We will

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1 come back to this topic, as you've got very important  
 2 issues that you need to explore, but I'm going to  
 3 suggest we carry on at 2 o'clock with that. I hope that  
 4 doesn't cause you any inconvenience.  
 5 Very well. 2 o'clock.  
 6 (12.46 pm)  
 7 (The Luncheon Adjournment)  
 8 (2.03 pm)  
 9 THE CHIEF CORONER: Yes, Mr Adamson.  
 10 MR ADAMSON: Mr Savage, I've been asked by the interpreter  
 11 for my clients if you could keep your voice up and speak  
 12 slowly. You do speak rather quickly and so it makes the  
 13 interpretation a challenging effort.  
 14 A. Will do.  
 15 Q. Thank you very much.  
 16 Mr Savage, before lunch we had considered the period  
 17 of time that somebody might remain on the surface of the  
 18 water, and I think you said that somebody who was  
 19 unconscious might remain on the surface of the water or  
 20 perhaps 1 to 2 feet below it for a period of up to  
 21 a couple of hours?  
 22 A. That's correct, sir.  
 23 Q. In section 5 of your report, you consider the factors on  
 24 the Thames on the night, and I think in essence what  
 25 you're saying is that, from your experience, the

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1 circumstances on the night were good from the  
 2 perspective of the prospect of identifying a casualty in  
 3 the water?  
 4 A. That's correct. I think if we look at the area in  
 5 concern, the river is about 250 metres wide. You  
 6 described the half a knot tide flow but that was  
 7 initially half a knot in one direction, with the tide  
 8 turn in half a knot in another direction, which means if  
 9 those times were equal, theoretically with physics, your  
 10 person would remain in the same location with the tide  
 11 flow in and then out.  
 12 Even with a tide flow of half a knot, half a mile in  
 13 an hour, if you anticipate that a search speed of a boat  
 14 is around about 5 knots, so you go very slowly so you  
 15 have optimal search, then you're going to cover that  
 16 half a mile in six minutes. So in the period of a  
 17 search duration, and let's say -- and I don't know the  
 18 exact search duration that night, but I believe you used  
 19 40-something minutes, then you can anticipate those legs  
 20 would have been eight or nine times up and down the  
 21 patch of water during that period of time.  
 22 Q. We certainly heard evidence that there were eight passes  
 23 as part of the structured search on that night.  
 24 A. And I think the night that -- to answer your question in  
 25 another fashion for you, the river has significant

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1 obstructions in multiple locations. Westminster Bridge  
 2 is a horrible bridge because you have Westminster Pier  
 3 and you have the London Eye and its associated  
 4 structures. London Bridge has clearer water around it,  
 5 it has less obstructions, and therefore it's a better  
 6 zone to search in, if that's an understood terminology.  
 7 It's also, the banks are not excessively lit, which  
 8 allows you better vision on the water.  
 9 Q. Yes.  
 10 THE CHIEF CORONER: And I think the other feature we heard,  
 11 Mr Adamson, was about the lighting underneath the arches  
 12 of the bridge which again was mentioned in other  
 13 evidence as being a factor which would help  
 14 surface-checking.  
 15 MR ADAMSON: Yes, but just in terms of the area, if you had  
 16 four boats conducting a line search, assuming that  
 17 they're relatively equally spaced, they're going to be  
 18 50 metres apart or so, aren't they?  
 19 A. Yes.  
 20 Q. And if you've got three boats, it's going to be greater  
 21 than that, 70 metres apart, or so?  
 22 A. Yes.  
 23 Q. In terms of your original estimate of the width of the  
 24 Thames, you were referring to the width of this  
 25 courtroom --

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1 A. It seems a lot smaller from a boat, I can assure you.  
 2 Q. I think we can agree, it's not three to four widths of  
 3 this courtroom?  
 4 A. In the quiet of lunchtime, I quite agree with you.  
 5 Q. So in fact, the space between the boats would be rather  
 6 greater?  
 7 A. Yes.  
 8 Q. And if you lose a boat from that search, that gap gets  
 9 even bigger still?  
 10 A. That's correct, however, I must add that the luxury of  
 11 four vessels searching, or even three vessels searching,  
 12 is an unknown luxury. For the Thames the majority of  
 13 searches carried out are one police boat and one  
 14 lifeboat.  
 15 Q. We heard from the coastguard that he was unaware that  
 16 the police vessels were also involved in warning people  
 17 away from the area during the search for Xavier, and  
 18 that he -- and I paraphrase -- would have wished to know  
 19 that and it would have had an influence on his overall  
 20 attitude to the scale of the search. Is that something  
 21 with which you agree?  
 22 A. I have to refer to the fact I wasn't there on the night.  
 23 What I will say, and I think it is important to say, is  
 24 that a search is only ever called off in conjunction  
 25 with all the people on the search. No searching

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1 authority, from my personal experience on the receiving  
 2 end of it, just says "We're stopping". It's a consensus  
 3 agreement and it's a consensus agreement from the people  
 4 that they have honestly and thoroughly covered the  
 5 ground. And I can assure you with a boat manned 50% by  
 6 volunteers who serve no other purpose than  
 7 altruistically saving of life, we do not go home if we  
 8 think that person is still on the surface. We search  
 9 and we search and we search, irrespective of the  
 10 weather, and it would have been a beautiful night to  
 11 search then, trust me, some of the minus 3 degree  
 12 searches in the Thames are a little bit interesting at  
 13 night when it is horrible and wet and dark, and we don't  
 14 go home unless we are sure they're not there.  
 15 Q. But it's certainly possible, isn't it, that Xavier might  
 16 have been missed in the course of this search over  
 17 a period of 47 minutes?  
 18 A. I think that's an impossible question for me to answer  
 19 for you, but with the luxury of three or four vessels  
 20 over an incredibly small search area, I think that is  
 21 highly unlikely, and that is one of the reasons why it  
 22 was majorly discounted from my report.  
 23 Q. Have you spoken to those who were involved in the search  
 24 on the evening?  
 25 A. In no detail.

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1 Q. How well do you know them?  
 2 A. I know them as colleagues on the station I serve on.  
 3 Q. Have you worked with them?  
 4 A. Yes. And I know, without sounding romantic, I trust my  
 5 life in every single one of their hands.  
 6 Q. Let us turn to your scenarios. Now, before we go  
 7 through each scenario, I think we're agreed that you  
 8 can't say whether Xavier entered the water in the  
 9 horizontal or the vertical?  
 10 A. Correct.  
 11 Q. And I think that you have accepted that the findings on  
 12 post mortem do not rule out submersion drowning?  
 13 A. I think they make it more unlikely.  
 14 Q. And you have accepted that somebody can remain on the  
 15 surface, or close to the surface, for a period of  
 16 a couple of hours?  
 17 A. That is correct, but please bear in mind, the minute  
 18 they are subsurface, eg the 1 to 2-foot scenario we've  
 19 talked about, they are out of sight. The Thames has  
 20 horrendous visibility. It's like a cup of tea.  
 21 Q. Yes, anyone who looks into the River Thames, and I have  
 22 done so on many occasions following my involvement in  
 23 this case, can recognise that it's a dark river in that  
 24 sense. But nevertheless, it is possible for somebody to  
 25 remain visible on the surface, isn't it, for a couple of

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1 hours? That's, I think, your evidence?  
 2 A. Yes.  
 3 Q. So turning to scenario A. Scenario A is "Drowning after  
 4 a period of surface time", and so in this model, Xavier  
 5 fell to the water, was conscious and remained at surface  
 6 level but subsequently effectively sunk, by either  
 7 peripheral cooling or hypothermia, and you've ruled that  
 8 out because of the absence of post mortem evidence of  
 9 drowning, the fact that Xavier would have been able to  
 10 shout for assistance, and the absence of musculoskeletal  
 11 injury.  
 12 A. Yes.  
 13 Q. You've also ruled it out because of the calmness of the  
 14 tidal conditions, and the water temperature?  
 15 A. Yes.  
 16 Q. In this model, how long do you think that Xavier would  
 17 have been able to remain on the surface as a relatively  
 18 young, healthy male?  
 19 A. Prior to submersion?  
 20 Q. Prior to submersion?  
 21 A. Up to -- impossible to give you an accurate answer. My  
 22 best guess, and there is no other term for it than my  
 23 best guess, within the region of an hour.  
 24 Q. An hour?  
 25 A. Half an hour to an hour, dependent upon anxiety levels,

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1 stress levels, body clothing, et cetera.

2 Q. Does physical exertion impact upon a person's ability in

3 the water to shout for assistance?

4 A. Not anecdotally. People can tread water and thrash

5 their arms and still scream quite successfully for

6 assistance.

7 Q. Does commotion elsewhere or in the vicinity impact upon

8 a vessel or search vessel's ability to hear the cry for

9 help of somebody in the water?

10 A. Not particularly. Sound is transmitted very easily on

11 the Thames and especially as you have high embankment

12 walls, it tends to reflect off, so actually sound is

13 picked up very, very easily. I was not there on the

14 night, I cannot tell you what the ambient noise

15 conditions were like, but in that area of the river, it

16 is easy to hear people.

17 Q. Yes. But on this model, assuming that Xavier was

18 capable of remaining on the surface for an hour, the

19 search was called off before that hour had elapsed; do

20 you agree?

21 A. I imagine the search was called off because the ground

22 had been covered so thoroughly so many times.

23 Q. Scenario B, this is "Drowning as unable to stay afloat

24 due to injuries". And so on this model, Xavier enters

25 the water, surfaces for a period of time, but is unable

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1 to tread water because of physical injury. And, again,

2 conscious throughout. You ruled this out because of the

3 absence of post mortem drowning evidence, the lack of

4 musculoskeletal injury, and because of tide flow and

5 calmness of the water conditions on the night which

6 would have facilitated a search for somebody in this

7 particular scenario.

8 A. Yes.

9 Q. In this scenario, how long do you anticipate Xavier

10 would have remained on the surface?

11 A. If he was unable to stay afloat because of injuries?

12 Q. Yes.

13 A. A very short period of time.

14 Q. Less than a minute?

15 A. It's honestly impossible to say, but you're in very

16 small numbers of minutes, you're not in tens of minutes

17 here. It takes a person only 2 to 3 minutes to thrash

18 and go under, so you are in low numbers of minutes.

19 Q. So we know that the first boat did not arrive until

20 7 minutes after Xavier had entered the water. So on

21 this scenario, you think that Xavier would probably have

22 been submerged by the time of that boat's arrival?

23 A. With significant enough injuries, yes.

24 Q. But that's not supported by the post mortem findings in

25 terms of the absence of musculoskeletal injury?

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1 A. That's my belief, yes.

2 Q. Yes. Scenario C, this is "Drowning as unable to surface

3 from depth due to injuries", and under this scenario,

4 Xavier enters the water and sinks below 5 metres, and is

5 unable to surface to the top due to limb injuries.

6 So as I understand it, on this model, Xavier would

7 have had to have entered the water vertically, or almost

8 vertically?

9 A. Yes.

10 Q. And we don't know whether that did or did not occur.

11 A. That's correct.

12 Q. And he did not return to the surface thereafter?

13 A. Correct.

14 Q. And so on this model, as I understand it, no search

15 would have been able to locate him?

16 A. Correct.

17 Q. Scenario D, "Drowning floating face-down on surface

18 after brain injury". So on this model, Xavier enters

19 the water and either the impact with the vehicle or the

20 impact with the water renders Xavier unconscious due to

21 head injury, and this rendered him face-down in the

22 water and unable to protect his airway.

23 On this model I think your two-hour estimate that

24 we've discussed earlier would be the sort of period of

25 time that Xavier might remain at the surface or near to

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1 the surface?

2 A. Surface or near the surface, correct.

3 Q. And you discounted this because of lack of post mortem

4 evidence of drowning, the lack of significant evidence

5 of physical head injury, and the adequacy or the tidal

6 conditions and the adequacy of the search on the night.

7 So coming back to my theme, which you will have

8 identified already, on this model, the search was called

9 off within the time frame that Xavier might have been

10 capable of being seen.

11 A. Had he been on the surface and not subsurface, yes.

12 Q. And you've excluded this for three reasons: lack of post

13 mortem evidence of drowning, which I think you've

14 accepted is not always present?

15 A. I think you have to please realise that I've had the

16 evidence I've had and all I'm trying to do is present

17 you with 13 different scenarios, of which we can't with

18 certainty -- and so it's literally trying to be

19 a process of elimination, to say "That's less likely

20 than this one".

21 Q. Yes, I appreciate you're doing your best. I am going to

22 work through each scenario. I acknowledge the point

23 that you have made.

24 The point that I was making was that I think you've

25 accepted that post mortem evidence of drowning is not

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1 always present?  
 2 A. Correct.  
 3 Q. The second reason that you have ruled this scenario out  
 4 is lack of post mortem evidence of physical head injury.  
 5 Now, are you talking about brain injury there or are you  
 6 talking about a visible external blow?  
 7 A. I'm talking about a brain injury.  
 8 Q. And, finally, the search conditions on the night.  
 9 I appreciate you don't agree, but I suggest to you it's  
 10 possible that he could have been missed on the night.  
 11 A. Impossible to say as I was not there, sir.  
 12 Q. Yes.  
 13 THE CHIEF CORONER: But I think one of the other caveats  
 14 you've said, again, is this point about "If on the  
 15 surface; subsurface, things change", and I think,  
 16 Mr Adamson, you accept that. It's those four words at  
 17 the end of that third bullet point.  
 18 MR ADAMSON: I acknowledge that if Xavier was subsurface,  
 19 even to the point of a couple of feet, then it's going  
 20 to be difficult for him to be identified.  
 21 THE CHIEF CORONER: Yes, to be seen on the surface.  
 22 MR ADAMSON: Yes.  
 23 A. Can I please say, not difficult; impossible.  
 24 Q. What I'm driving at is the possibility --  
 25 THE CHIEF CORONER: Perhaps this: if he is on the surface,

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1 I get that, as I say, it's just the caveat that  
 2 I think ...  
 3 MR ADAMSON: I don't wish to be unfair in the questions I am  
 4 putting.  
 5 THE CHIEF CORONER: No, no.  
 6 MR ADAMSON: Scenario E, "Drowning subsurface after brain  
 7 injury", so that's a similar scenario to the one we have  
 8 just heard, but on this scenario, Xavier does not return  
 9 to the surface upon entry; is that right?  
 10 A. Yes.  
 11 Q. And so on this scenario, in essence, no search is ever  
 12 going to find him?  
 13 A. Correct, sir.  
 14 Q. Scenario F, "Death on the surface due to cold water  
 15 shock response". Now, just to foreshadow the questions  
 16 on this, in this scenario, Xavier falls, he remains on  
 17 the surface or slightly subsurface.  
 18 A. Yes.  
 19 Q. And does your two-hour timeline apply to this scenario  
 20 as well, ie he might have remained at that sort of level  
 21 for a period of two hours?  
 22 A. For a period of up to two hours.  
 23 Q. Up to two hours?  
 24 A. Yes.  
 25 Q. And so again, subject to the caveats that we have

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1 already fleshed out, on this scenario, the search is  
 2 called off at a time when it was at least possible that  
 3 he might have been there to be found?  
 4 A. Accepting the questions you have asked me already.  
 5 Q. You've ruled out this scenario because of the absence of  
 6 post mortem evidence of drowning, and I've already made  
 7 my points in relation to that, I won't put them again,  
 8 the water temperature, ie, in your experience it's  
 9 probably not cold enough for this scenario?  
 10 A. Less likely, yes.  
 11 Q. But it's still possible?  
 12 A. It is still physiologically possible, but less likely.  
 13 Q. And your observations in relation to the search  
 14 conditions on the night?  
 15 A. Yes.  
 16 Q. Scenario G, "Death subsurface due to cold water shock  
 17 response". Same scenario, but on this model, Xavier  
 18 goes straight under the water and does not return.  
 19 A. Yes.  
 20 Q. So, again, this is a scenario which requires horizontal  
 21 or -- a vertical or near vertical entry.  
 22 A. Yes.  
 23 Q. Which we don't know.  
 24 A. Yes.  
 25 Q. So this scenario, no search is going to find him?

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1 A. Correct, sir.  
 2 Q. Scenario H, "Death on the surface due to autonomic  
 3 conflict". This scenario, the impact that Xavier has  
 4 with the water you have described as "Face-first".  
 5 A. To fire autonomic conflict you need an immersion of the  
 6 face on top of an immersion of the body. So just to  
 7 recap autonomic conflict, you have to have one side of  
 8 the autonomic nervous system firing, the sympathetic  
 9 side, that's either caused by whole body immersion, or  
 10 we sort of explored, by a fear response.  
 11 And then on top of that you have to superimpose  
 12 a face splash. So this is either, in this case,  
 13 somebody on the surface receiving a splash to the face  
 14 from potentially a wave, or this is somebody who has  
 15 gone, at the same time as firing off a cold shock  
 16 response by entering the water, their face is  
 17 immediately impacted as well.  
 18 Q. What about if moments before the fall there has been  
 19 an impact with a vehicle?  
 20 A. If that was enough to fire off the sympathetic side of  
 21 the autonomic nervous system, then it is theoretically,  
 22 and I have to stress theoretically, because it is still  
 23 all in the research stages, theoretically possible that  
 24 combined with wet face can cause autonomic conflict.  
 25 Q. And so you've discounted this for two reasons: water

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1 temperature, and that's presumably the impact of the  
 2 water temperature on the face being not sufficiently --  
 3 the water is not sufficiently cold to trigger that  
 4 reaction --  
 5 A. The aggressiveness of that reaction.  
 6 Q. And the adequacy of the search conditions, and the  
 7 likelihood of identification on the night.  
 8 On this model, again, do I understand your evidence  
 9 that a person in this circumstance would be on the  
 10 surface for perhaps up to two hours?  
 11 A. The same conditions, yes, if they are dead on the  
 12 surface, and I stress again on the surface, and again,  
 13 there are so many factors, you have a sliding scale  
 14 there of anything from 5 minutes to 2 hours, but you do  
 15 have that surface interval, as we call it, yes.  
 16 Q. Yes, and so, again on this model, the search was called  
 17 off at a time when it was theoretically possible that he  
 18 could have been located?  
 19 A. Yes.  
 20 Q. Subject to the caveats that you have given?  
 21 A. Yes.  
 22 Q. Does your evidence that the combination of contact with  
 23 the vehicle followed by an impact face- first with the  
 24 water cause you to reflect upon your conclusion that  
 25 this was a scenario that is unlikely and can be

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1 discounted?  
 2 A. I think it's more related to the next scenario, I,  
 3 because if falling from height the first impact is his  
 4 face, then he's likely to penetrate to depth, which is  
 5 why death subsurface due to autonomic conflict was one  
 6 of the ones that needed serious consideration. Whereas  
 7 for him to have impacted his face first, unless he was  
 8 coming down completely horizontally, face- first, which  
 9 is a possibility, but as a human body falls, it is more  
 10 likely that the angle will start to pitch up. So that's  
 11 one of the reasons why H became less likely and I became  
 12 more likely.  
 13 Q. So H -- before we leave H, in terms of the trigger for  
 14 autonomic conflict, when I think of somebody falling  
 15 face- first, I think of them falling with their face down  
 16 rather than the top of the head going into the water; is  
 17 that a false distinction that I'm drawing, or are you  
 18 saying that that is an accurate distinction?  
 19 A. I'm talking about people ending up in a diving position  
 20 where, as they enter, it's forehead and nose first as  
 21 opposed to, you are thinking horizontal face plant.  
 22 Q. Yes.  
 23 A. Most people, and this is purely anecdotally, I have sat  
 24 under too many bridges and seen too many people jump,  
 25 most people do not come down in a sort of belly flop

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1 fashion. They either come down and their feet start to  
 2 come down, or they come down and their head comes down  
 3 first.  
 4 Q. Scenario I, "Death subsurface due to autonomic  
 5 conflict", and I think you have touched upon this  
 6 already, in this model Xavier goes straight under and  
 7 again, no search is likely to find him.  
 8 A. Correct, sir.  
 9 Q. Scenario J, "Death on subsurface due to impact brain  
 10 apnoea". Here, again, am I right to think that on this  
 11 model he would have potentially remained on the surface  
 12 for up to a couple of hours?  
 13 A. The same conditions we have been discussing, yes.  
 14 Q. I'm sorry if I'm doing this in a pedestrian fashion, but  
 15 it's important that I adduce this so that my clients  
 16 understand this. On this model, again, search called  
 17 off at a time when he was potentially capable of being  
 18 identified?  
 19 A. Identified but not saved.  
 20 Q. Is this in effect a form of instantaneous death; is that  
 21 what you are ...?  
 22 A. It's an instantaneous cessation of breathing, which  
 23 means for as long as that breathing doesn't occur, you  
 24 then go on to hypoxic cardiac arrest. So you will be in  
 25 hypoxic cardiac arrest theoretically anything from 3 to

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1 5 minutes after that.  
 2 So, in effect, search duration in this case becomes  
 3 irrelevant because death would be really quite fast.  
 4 Q. Yes. And just so I'm clear, and I know this may sound  
 5 like a silly question, in this model, Xavier would not  
 6 be conscious; is that right?  
 7 A. Correct.  
 8 Q. Scenario K, "Death subsurface due to impact brain  
 9 apnoea". This is the same mechanism of death but  
 10 occurring subsurface and so, again, a search under this  
 11 model would not have identified Xavier.  
 12 A. He would never return to the surface, yes.  
 13 Q. And so of your 11 scenarios, six are surface or almost  
 14 at the surface deaths, five are subsurface. I'm right,  
 15 I think, in saying that in relation to each of the  
 16 surface mechanisms of death, the search was called off  
 17 at a time when it was theoretically possible that Xavier  
 18 could have been located?  
 19 A. Let me look at the exact six so I can give you an answer  
 20 to that, sir.  
 21 THE CHIEF CORONER: One of those, I think, was scenario B,  
 22 where I think, Mr Adamson --  
 23 MR ADAMSON: You're quite right, sir, you're quite right.  
 24 Five.  
 25 A. And I do believe also scenario J, the impact brain

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1 apnoea scenario we discussed on the surface, there  
 2 wouldn't have been a survival time associated with that  
 3 either.  
 4 MR ADAMSON: But that's survival.  
 5 THE CHIEF CORONER: He would have been located within the  
 6 two hours, but he would not have been alive.  
 7 MR ADAMSON: Would not have survived.  
 8 THE CHIEF CORONER: So I think that means that you are  
 9 right, Mr Adamson, there are five in which location  
 10 would have taken place on the evidence potentially  
 11 within the two hours.  
 12 MR ADAMSON: Yes.  
 13 THE CHIEF CORONER: But of those, one would have been  
 14 instantaneously fatal.  
 15 A. To put it in perspective, sir, the only two that have  
 16 any survivability during that time frame is scenario A,  
 17 and dependent on the level of injuries, scenario B.  
 18 Whereas the other surface ones involve either immediate  
 19 or fairly instantaneous cardiac arrest, which if you are  
 20 not recovering the patient within the first -- let's be  
 21 generous -- sub 10 minutes, will prove to be fatal.  
 22 That is a reason why the Thames lifeboat system exists  
 23 as it does with a 90-second launch from station, because  
 24 people don't have the survivability that we have round  
 25 the coast.

1 MR ADAMSON: Sorry, at Waterloo you launch within 90 seconds  
 2 of being notified?  
 3 A. If the boat is on station, our operating procedure is to  
 4 be gone within 90 seconds. We remain on the station  
 5 fully kitted with the absence of a lifejacket and  
 6 a crash helmet, the only things we would put on and go.  
 7 That's the Thames lifeboat operating procedure, is to be  
 8 lines away in 90 seconds, and it's set up that you can  
 9 span your patch in a period of time whilst there is  
 10 still survivability.  
 11 MR ADAMSON: Thank you very much, Mr Savage.  
 12 Sorry -- sir, may I be given one moment?  
 13 THE CHIEF CORONER: Of course, Mr Adamson. (Pause).  
 14 MR ADAMSON: Mr Savage, one more topic, please.  
 15 We've heard that the thermal cameras that were  
 16 available to the marine police units, the infrared  
 17 cameras, the thermal cameras were not being used on the  
 18 night. In relation to your scenarios, those which  
 19 involved Xavier being on the surface, would those  
 20 scenarios have enabled somebody using such technology to  
 21 locate Xavier?  
 22 A. I cannot answer with certainty for you, sir, because we  
 23 do not use that technology, therefore I don't have  
 24 in-depth knowledge of that technology, I am afraid.  
 25 Q. What technology, if any, do the RNLI have in relation to

1 that?  
 2 A. We use search lights and night vision equipment.  
 3 Q. Do you know if night vision equipment was being used on  
 4 the night?  
 5 A. I don't, I am afraid.  
 6 MR ADAMSON: Thank you.  
 7 Questions by MR HORWELL QC  
 8 MR HORWELL: I appear on behalf of the Commissioner for the  
 9 Metropolitan Police.  
 10 Did you know that there was a helicopter that was  
 11 used that had thermal imaging equipment?  
 12 A. I didn't, sir, but I know that in many of the searches  
 13 that we have on the Thames, the NPAS police helicopter  
 14 is used and produces immediate effective results for us.  
 15 Q. You have said on number of occasions that you bring with  
 16 you into the witness box 30 years of experience, and it  
 17 is from your experience that you have been able to say  
 18 that those who want to be rescued are very able to make  
 19 their presence aware to rescue craft?  
 20 A. In the absence of a disabling condition stopping you  
 21 speaking or screaming, that is correct, sir.  
 22 Q. You've been asked a number of questions as to whether or  
 23 not Xavier would have been seen if above the surface,  
 24 alive or dead, and you've discounted a number of these  
 25 scenarios as being unlikely because he wasn't seen, and

1 you base that answer, do you, on your 30 years'  
 2 experience, knowing that a hasty search conducted by two  
 3 police marine boats that started within about 7 minutes  
 4 of his entering the water, that if he had been above the  
 5 surface, he would have been likely to have been seen  
 6 during the course of that hasty search?  
 7 A. I cannot agree more with you, sir. We have, amongst the  
 8 marine police, London Fire Brigade and RNLI, and the  
 9 Port of London Authority, and I cannot put a number on  
 10 it for you, but a ridiculous success rate of recovery of  
 11 people from the surface, and we do not go home if we  
 12 think they are still on the surface.  
 13 Q. And as you know and as you have been asked about,  
 14 following that hasty search, there was then the  
 15 coordinated line abreast search which started with four  
 16 boats and was then reduced to three.  
 17 A. Yes.  
 18 Q. And if he had have been above the surface, it's your  
 19 experience that he would have been seen?  
 20 A. I would say to you, sir, that we have found so many  
 21 people with just one boat that four is an unbelievable  
 22 luxury for that night. Three is still a highly  
 23 successful search pattern for a piece of water that is  
 24 only that diameter.  
 25 MR HORWELL: Thank you.

1 Further questions by MR HOUGH QC  
 2 MR HOUGH: Just a couple of final points, Mr Savage.  
 3 Because of the way that you approached your report, you  
 4 asked yourself on a number of occasions which was the  
 5 most probable of various scenarios. What I'm going to  
 6 ask you to do now is consider a number of propositions  
 7 and to say whether it is probable, that's to say more  
 8 likely than not; do you understand?  
 9 A. Yes, sir.  
 10 Q. First of all, is it probable that Xavier was not visible  
 11 on the surface at the time of the search?  
 12 A. I believe that to be the case, sir.  
 13 Q. Based on what you've said to Mr Horwell, would you go so  
 14 far as to say that it is very probable that Xavier was  
 15 not visible on the surface during the search?  
 16 A. I think with the piece of information I've just received  
 17 that I did not know before about the police helicopter,  
 18 if you introduce a police helicopter into that search  
 19 pattern as well, I would say it's incredibly unlikely  
 20 that he was on the surface.  
 21 Q. Next point. Do you consider it probable, more likely  
 22 than not, that Xavier did not drown by submersion, by  
 23 breathing in water?  
 24 A. With my best knowledge, and I am not a pathologist,  
 25 I believe that there would have been far more symptoms

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1 at post mortem had he received that as a route of death.  
 2 Q. But for reasons you've given to Mr Adamson, you can't  
 3 say that with certainty or a very high level of  
 4 confidence?  
 5 A. I can't with 100 per cent certainty say that, sir.  
 6 Q. Next, is it therefore probable that Xavier died due to  
 7 one of the physical processes: cold water shock response  
 8 and arrhythmia, autonomic conflict or impact brain  
 9 apnoea?  
 10 A. I feel that is the most likely of the three scenarios,  
 11 sir.  
 12 Q. I'm going to ask you the question again: is it more  
 13 likely than not --  
 14 A. Yes.  
 15 Q. -- that Xavier died of one of those three processes?  
 16 A. That's my belief.  
 17 Q. And, thirdly, or fourthly I think now, is it probable,  
 18 more likely than not, Xavier died before the search was  
 19 called off, whether above or below the surface?  
 20 A. I feel that is far more likely.  
 21 MR HOUGH: Thank you very much. Those are all my questions.  
 22 A. Thank you.  
 23 MR HOUGH: That's all our evidence today, sir, and for this  
 24 week.  
 25 May I just make one matter known to everyone, which

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1 is that next week we are making one change to the  
 2 published timetable, which is to move DS Ager from  
 3 Wednesday to Friday, Friday morning.  
 4 THE CHIEF CORONER: Thank you. But otherwise we are staying  
 5 as per the script.  
 6 MR HOUGH: Exactly.  
 7 THE CHIEF CORONER: Mr Savage, can I thank you very much for  
 8 coming to give evidence, very clear, if I might say so,  
 9 the different scenarios. Mr Adamson has very properly  
 10 explored those differing scenarios with you and one of  
 11 the things I picked up from quite a bit of what you said  
 12 is that some of the scenarios which you dealt with are  
 13 very much based upon material which hasn't been tested  
 14 over your 30 years of experience. Some of it is very  
 15 recent thinking, some, I think you said the research is  
 16 only 2016, but at least you have set out all of those  
 17 potential scenarios, at least, for me to consider.  
 18 Thank you very much.  
 19 A. Please may I say one thing at the end, sir.  
 20 THE CHIEF CORONER: Of course.  
 21 A. For the benefit of the family I would just like to say  
 22 it's my absolute strong belief that Mr Thomas entered  
 23 the water and died of any of those three conditions we  
 24 have discussed virtually instantly and in doing so,  
 25 would have had no suffering.

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1 MR HOUGH: Thank you very much.  
 2 THE CHIEF CORONER: Mr Hough, we will meet again on Tuesday,  
 3 so I hope that everyone has a rest over the bank holiday  
 4 weekend. Being a bank holiday weekend in this country,  
 5 one can't predict the weather, one can't predict  
 6 anything other than chaos on the roads and everywhere  
 7 else, but I hope at least everyone has a rest at the  
 8 weekend.  
 9 (2.45 pm)

(The court adjourned until 10.00 am on  
 Tuesday, 28 May 2019)

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