Neutral Citation Number: [2025] EWCA Civ 467

Case No: CA-2024-000079

IN THE COURT OF APPEAL (CIVIL DIVISION)
ON APPEAL FROM THE HIGH COURT OF JUSTICE
KINGS BENCH DIVISION
His Honour Judge Simon
[2023] EWHC 3010 (KB)

Royal Courts of Justice
Strand, London, WC2A 2LL

Date: 15/04/2025

Before:

LORD JUSTICE COULSON
LADY JUSTICE NICOLA DAVIES
and
LORD JUSTICE ZACAROLI

- -

Between:

Alexander Johnstone (Personal Representative of the Estate of Elaine Johnstone, Deceased)	**Appellant**
- and -	
Fawcett's Garage (Newbury) Limited	**Respondent**

- -
- -

Steven Snowden KC, John-Paul Swoboda and Helen Waller (instructed by **Boyes Turner LLP**) for the **Appellant**
David Platt KC and A John Williams (instructed by **Weightmans LLP**) for the **Respondent**

Hearing dates: 13 & 14 February 2025

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Approved Judgment

This judgment was handed down remotely at 10.30am on 15 April 2025 by circulation to the parties or their representatives by e-mail and by release to the National Archives.

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LORD JUSTICE COULSON, LADY JUSTICE NICOLA DAVIES AND LORD JUSTICE ZACAROLI:

1. Introduction

1. Mrs Elaine Johnstone ("Mrs Johnstone") died from malignant mesothelioma on 31 August 2019. She had suffered from the effects of the disease for a little more than a year, having been formally diagnosed with mesothelioma in November 2018. Otherwise she had generally been in good health.

2. Her husband, Mr Alexander Johnstone ("the appellant"), brought proceedings against the respondent garage ("the garage"), where Mrs Johnstone had worked in an office for a period of some 7½ years between 1982 and 1989. It was the appellant's case that, as a result of her employment at the garage, Mrs Johnstone was exposed to asbestos such that there was a material increase in risk of her developing mesothelioma. Her office was across a yard from the garage's workshop.

3. The respondent admitted that, during the period of Mrs Johnstone's employment, there were unsafe practices in use in that workshop, in particular that an air-line was used to blow out dust and asbestos fibres from existing brake shoes and clutch drive plates, as well as from processes applied to new ones being fitted. The air-line was used at three different times: when starting a service, when finishing the job and as part of clearing out the lube bay at the end of each day. In addition a grinding machine or manual filing would be used on new brake shoes to get them to the appropriate size (see [12] of the judgment below). The respondent also admitted breach by failing to change those unsafe working practices despite requirements to do so. The effect of using the air-line, hand file and grinding machine produced clouds of dust containing asbestos fibres (see [13] of the judgment below).

4. Notwithstanding those concessions, the garage denied that it was responsible for a material increase in risk of Mrs Johnstone developing mesothelioma. Accordingly, at trial, the principal issue was causation.

2. The Trial and The Judgment

5. The trial took place over five days in April 2023 before His Honour Judge Simon, sitting as a High Court Judge ("the judge"). The factual evidence was limited, the principal evidence coming from a mechanic, Raymond Russell ("RR") who worked at the garage at the relevant time. His evidence was in the form of a written statement, because he was not medically fit to attend court due to age and infirmity.

6. The bulk of the oral evidence was given by experts of which there were a total of six. As the judge noted, they gave their evidence in pairs as follows:

   (a) Christopher Chambers, (appellant's Occupational Health and Safety Practitioner) and Martin Stear, (the garage's Occupational Hygienist);

   (b) Professor John Norrie, (appellant's Biostatistician and Epidemiologist), and Professor Stephen Jones, the garage's Professor of Environmental and Occupational Toxicology);

(c) Dr Charles Twort, (appellant's Consultant Chest Physician) and Doctor John Moore-Gillon, (the garage's Consultant Chest Physician).

7. The final submissions following the trial were heard on 12 June 2023. The judgment ([2023] EWHC 3010 (KB)) was handed down on 13 December 2023. The judge concluded that there was an increase of 0.1% or less in the risk of Mrs Johnstone developing mesothelioma caused by the respondent. He said that that was "such a small increase" that it did "not satisfy the test of materiality" [113].

8. The structure of the judgment was as follows:

(a) After an introduction and some other matters at [1]-[9], the judge set out the background at [10]-[17].

(b) The judge set out the factual evidence at trial from [18]-[27].

(c) The judge set out the expert evidence at trial from [28]-[68]. He dealt with that evidence pair by pair.

(d) The judge set out the submissions made by the parties from [69]-[78].

(e) The judge's analysis and discussion is at [79]-[114].

9. The judge approached his analysis in three stages. The first stage involved the calculation of RR's likely exposure to asbestos, something that he described as a key element in comprehending the particular practices at the respondent's garage that pertained to working with asbestos-containing car parts. The second stage used RR's exposure to calculate Mrs Johnstone's own exposure. The third stage concerned the calculation of the increase in risk to Mrs Johnstone of contracting mesothelioma from her exposure at the garage.

10. As to stage one, the judge identified the relevant evidence from RR's statement at [23] – [26] as follows:

> "23…He undertook car servicing in a dedicated lubrication bay (the lube bay), opposite the office in which EJ and another lady worked. He estimated that the lube bay door was no more than eight yards from the office. The lube bay's sliding doors were almost always open, save in very cold weather, as RR was using a compressed air-line. RR believed the office door was kept closed, except in hot weather.
>
> 24. RR's job was to service and maintain vehicles brought into the workshop. This brought him regularly into contact with asbestos, particularly in the course of replacing brake shoes and clutch drive plates. The brake linings and clutch linings contained asbestos. RR described the process, undertaken by him regularly, of removing brake drums, which would have dust and dirt where the brake linings had deteriorated through wear and tear. The asbestos brake shoes and clutch drive plates would wear out over time creating dust within the brake drum and clutch housing. Whether replacing or renewing brake linings and clutch plates, RR used a compressed air-line to blow dust out of the drum, shoes, brake drum plates and clutch housing. This process released clouds of

> dust into the lube bay as well as out into the yard, the air-line being used to blow it out there. RR described being covered in asbestos dust, on his hands, face, hair and overalls.
>
> 25. In addition to blowing out the brake dust, RR often sanded the asbestos dust from the brake shoes and filed the edges to ensure a smooth connection. This would be done by chamfering, usually by hand with a coarse file, but occasionally with a grinding machine. RR would wear a single pair of overalls for a week at a time, after which they would be laundered. His own clothes beneath would also get contaminated. RR described seeing EJ most days as he would often have to go into the office if he needed something.
>
> 26. Understandably, RR could not provide a definitive figure for how often he serviced vehicles over the more than thirty-five years that he worked for D, but it was a regular part of his job. He stated, "On average, bearing in mind there were some weeks when I would do it more than others, I estimate that one day a week was spent servicing brake shoes and clutch drive plates and using a compressed airline in the manner that I've described to blow out brake drums and clutch plate housing before I started working on them and again once I'd finished the job.""

11. At [91] the judge pointed out the limitations of that evidence. He then went on to make particular findings about RR's exposure at [93]-[97]. Amongst other things, he found that:

    (a) RR spent one day a week of dust-generating activity related to asbestos with some allowance for weeks when more than that period of time would be devoted to such activities [93];

    (b) RR was involved in asbestos-related activity for a percentage of that average of one day per week because the one day referred to by RR did not exclude all associated, non-dust producing activities [95], [97].

12. There was a significant difference between the estimate of the exposure suffered by RR adopted by Mr Chambers (4.71 f/ml-y[1]) and the figure calculated by Mr Stear (1.0 f/ml-y). The judge concluded that Mr Chambers' approach was "not reflective of the factual scenario as I find it to be" [97]. In consequence he found that Mr Stear's calculations were likely to be considerably closer to the actual figure. On this basis, he found at [98] that RR's cumulative exposure across the relevant period was, on the balance of probability, of the order of 1f/ml-y or less. This figure may have been an overestimate, because it made no allowance for the fact that, during the 1980's, asbestos was replaced by drum brakes and shoes [98].

13. The second stage of the calculation was to identify Mrs Johnstone's exposure relative to that of RR. There were three passages in the judgement setting out the judge's relevant findings of fact. At [82], he said:

> "82. The following matters pertaining to the relevant period did not appear to be in dispute and/or were matters about which there was no evidence to the contrary:

[1] Asbestos fibres per millilitre of air over the course of a year: see paragraph 57 below.

(i) The physical location of the lube bay and the office in which EJ worked, relative one to the other;

(ii) The lube bay doors would usually be open, unless the weather was particularly cold;

(iii) The office door would usually be closed, unless the weather was particularly warm;

(iv) Dust containing asbestos would be generated within the lube bay during the various tasks described by RR due his use of a compressed air line;

(v) Use of the air line during tasks created dust both within the lube bay and, when the lube bay doors were open, out into the yard;

(vi) The air-line was also used at the end of a working day to clean out the lube bay by blowing dust and detritus into the communal yard that separated the lube bay and office;

(vii) The asbestos used in drum brake and clutch linings was chrysotile (albeit commercial chrysotile generally contained tremolite, an amphibole form of asbestos);

(viii) Chrysotile asbestos is recognised to be of substantially lower potency in inducing MMP when compared with amosite or crocidolite);

(ix) The asbestos component of the dust produced from used brakes and clutches that were being replaced would have been approximately 1–2 % thereof, as a result of chemical changes caused during use;

(x) The communal yard was partially covered in at the front by the entrance/exit to the garage."

14. In addition, at [102] and [103], the judge identified the circumstances in which Mrs Johnstone would likely have come into contact with asbestos-containing dust. He said:

> "102…The evidence from C and RR identifies the following points, with my additional observations added in brackets:
> (i) EJ's leaving work at the end of the day when it coincided with RR cleaning out the workshop with the air-line (potentially one day per week with some weeks involving more than one day);
>
> (ii) During visits by RR to EJ's office (one or more visits on one day or occasionally more per week with asbestos-containing dust from that day's work on overalls and on his person, as well as on other days when wearing overalls with previously contaminated dust on them);
>
> (iii) When the office and lube bay doors were simultaneously open (which seems to have been only occasionally);
>
> (iv) On occasions when EJ was walking across the forecourt (referred to as more than once a day by C); and

> (v) On (rare) occasions when EJ may have gone into the lube bay on a day when asbestos-containing dust was being generated.
>
> 103. RR's evidence is that the office door was eight yards away (about 25 feet) from the lube bay and this was the focus of Messrs Chambers' and Stear's consideration of percentage estimates. Mr Chambers assumed a 90% reduction for 20-30 feet distance indoors and a further 50% reduction for short distance outdoors, reaching an exposure percentage of 5% relative to RR's. Mr Stear considered likely time spent by EJ walking across the courtyard as a proportion of a day, applying it to a figure for 20-30 feet distance from source. This results in a range of 0.001 to 0.002 f/ml-y for an estimated time period of five to ten minutes."

15. Again, therefore, the judge found that Mr Stear's calculation of Mrs Johnstone's exposure was more accurate than that of Mr Chambers and, as a result, at [104]-[107] the judge concluded that Mrs Johnstone's exposure was somewhere in the region of 0.001 to 0.002 f/ml-y.

16. The third and final stage of the exercise was for the judge to calculate the material increase in risk caused by Mrs Johnstone's exposure to asbestos at the garage. This exercise was undertaken at paragraphs [108] - [113] of the judgment. We shall have to refer to that analysis in greater detail in relation to Grounds 1-4 below. At this stage it is sufficient to note that the judge preferred the evidence of Professor Jones and found that any increase in risk was "in the order of 0.1% or less". Because that was not a material increase in risk, the claim failed.

3. The Issues on Appeal

17. There are five grounds of appeal. Ground 1 is concerned with Professor Norrie's evidence and the appellant's submission that the judge misunderstood an important element of it. Ground 2 is based on the submission that the judge misunderstood the evidence relating to the risk to Mrs Johnstone of developing mesothelioma otherwise than through her exposure at the garage. Ground 3 is a broader attack on the methodology used by the garage's experts, and endorsed by the judge, which was referred to by the parties as Method 2. It is the appellant's case that a simpler methodology, which has been called Method 1, should have been adopted. Ground 4 of the appeal is closely linked, because it is a complaint that the judge failed to adjudicate on why Method 1 or Method 2 should be adopted. There is also a Respondent's Notice which seeks to support the judge's conclusions by reference to what the garage have called Method 3. As explained in paragraph 55 below, we have preferred to use different (and we hope more helpful) descriptions of the competing methodologies.

18. It will be seen that the first four grounds of appeal, and the Respondent's Notice, all go to the third and final stage of the judge's analysis, namely the calculation of the increased risk of mesothelioma to Mrs Johnstone caused by her exposure at the garage, and whether or not it was material. These first four grounds do not raise any issues in relation to the first two stages of the exercise, namely the judge's calculation of the exposure to RR, and the consequent calculation of the exposure to Mrs Johnstone.

19. Ground 5, however, is an oblique attack on those first two stages of the judge's analysis. It is said that the judge erred in refusing to draw an adverse inference against the garage

because of its failure to keep proper air monitoring records. Although not entirely clear from the grounds of appeal, it was the appellant's case in the skeleton argument, and repeated orally, that the judge should have used the adverse inference to dismiss the expert evidence of Mr Stear, and to find as proved the evidence of Mr Chambers. In that way, therefore, because Ground 5 went to the first two stages of the judge's analysis, Mr Snowden KC dealt with Ground 5 first. We shall follow the same course.

4. Ground 5: The Adverse Inference

20. The modern law relating to adverse inferences can be traced from *British Railways Board v Herrington* [1972] AC 877, where a defendant's failure to call evidence about the state of the fence meant that it could not complain if the court drew from the facts which had been disclosed "all reasonable inferences as to what are the facts that the defendant has chosen to withhold" Many of the subsequent cases, such as *Wiszniewski v Central Manchester Health Authority* [1998] PIQR P324 concern the silence or absence of a witness.

21. In *Keefe v The Isle of Man Steam Packet Co. Limited* [2010] EWCA Civ 683 the Court of Appeal held that the defendant could not assert that noise levels on its boats were not excessive when it was in breach of the duty to measure those levels. There had been contrasting evidence of fact: the claimant had given quite detailed evidence about excessive noise on the boats; a captain had said rather more generally that the boats were not that noisy. The claim failed at first instance but the appeal was allowed. That was because of this court's "serious reservations" about the judge's reasons for rejecting the claimant's evidence, and the fact that the defendant had "made it difficult or impossible for a claimant to adduce relevant evidence" about noise levels, so had to run the risk of adverse factual findings. Longmore LJ said at [19] that "in such circumstances the court should judge a claimant's evidence benevolently, and the defendant's evidence critically".

22. *Keefe* was distinguished by Lloyd-Jones J (as he then was) in *Shawe-Lincoln v Neelakandan* [2012] EWHC 1150 (QB), noting that the reference to a benevolent/critical approach fitted well with a situation where a defendant made it difficult or impossible for a claimant to adduce relevant evidence. More generally, Lloyd-Jones J said:

> "82. Whether it is appropriate to draw an inference at all and, if so, the precise nature and extent of such an inference will depend on the particular circumstances of each case. Relevant considerations will include the proximity between a breach of duty and the non-available evidence, the effect of the other evidence before the court and what other evidence might have been available but which is not before the court."

23. The most recent case in this line is *Mackenzie v Alcoa Manufacturing (GB) Limited* [2019] EWCA Civ 2110 in which Dingemans LJ referred to the principle that whether it is appropriate to draw an inference, and if so the nature and extent of the inference, will depend on the facts of the particular case; and that a failure to adduce relevant documents may convert evidence on the other side into proof, but that may depend on the explanation given for the absence of the documents.

24. As we shall see, the basis on which the appellant sought an adverse inference here, and the precise nature of the adverse inference sought, varied during both the trial and the appeal. But it seems tolerably clear that, by the end of the trial, the appellant's case was that, because there should have been air monitoring records in the workshop but were not, the judge should have accepted Mr Chambers' much higher exposure figures rather than those calculated by Mr Stear. The judge rejected that submission, saying at [100]:

> "100. I have also considered carefully the adverse inference point made by C, but I do not find it helpful in this case. The difference between the calculations of the occupational hygienists rested in large measure on their very different interpretation of RR's evidence, which required judicial determination. Any measuring of levels could only have assisted in relation to RR's exposure, but would then have been the subject of judicial determination as to what such figures represented. Any measurement would not have assisted in relation to identifying the reduction factors to be applied to EJ's exposure, which also required judicial determination. It does not seem to me be a sustainable argument that the lack of monitoring should lead the Court to adopt uncritically Mr Chambers' calculations in circumstances where I have concluded that they do not reflect the factual matrix I have found to exist at the relevant time."

25. On appeal, it seemed to the court that the appellant needed to demonstrate that that passage was, in some way, wrong in principle. After all, the extent to which a trial judge accedes (or otherwise) to a submission that he or she should draw an adverse inference is well within his or her remit as the fact-finding tribunal. But, beyond saying that the judge should not have found that factual matrix, Mr Snowden did not approach his task that way. Instead, he largely repeated the argument that had failed before the judge to the effect that, if the respondent had kept the records that they were obliged to, it would have been clear just how much asbestos RR was exposed to, and therefore a much more accurate picture would have been provided of Mrs Johnstone's exposure. He submitted that the respondent should not be able to take advantage of its own wrong in failing to keep those records, and that therefore the judge should have used Mr Chambers' exposure figures, and not those of Mr Stear. If that submission was correct, and Mr Chambers' figures were used, then the effect on the final stage of the calculation, namely that of the material increase in risk, would mean that the appellant's case was proved.

26. It seems to us, for the reasons noted below, that this ambitious submission, attractively though it was argued, must fail for a variety of reasons.

27. First, the argument about the failure to keep air monitoring records in breach of Regulation 15 of The Control of Asbestos at Work Regulations 1987, was not part of the appellant's opening at trial: that had identified a different alleged breach (of Regulation 16, in relation to health records) which has since been abandoned. It is therefore unsurprising that the issue of air monitoring records was not addressed in detail at the trial or in the judgment. It is always difficult, and often impossible, for this court to decide points which were not the subject of detailed evidence below. Here, there might have been all sort of issues that could have been explored. When was the duty to keep such records in play, relative to Mrs Johnson's employment? What would the records have shown, particularly given the reduction in the use of asbestos in brake linings during the 1980's? Since the records would have related to the workshop only,

what was their relevance, if any, to the position in the office? How long should such records have been kept? And so on.

28. The time that such records had to be retained turned on whether the levels of asbestos went beyond an "action level". The relevant parts of the 1987 Regulations are in these terms:

> "2.—(1) In these Regulations, unless the context otherwise requires—
>
> "action level" means one of the following cumulative exposures to asbestos over a continuous 12-week period when measured or calculated by a method approved by the Health and Safety Commission, namely—
>
> (a) where the exposure is to asbestos consisting of or containing any crocidolite or amosite, 48 fibre-hours per millilitre of air; or
>
> (b) where the exposure is to asbestos consisting of or containing any other types of asbestos but not crocidolite or amosite, 120 fibre-hours per millilitre of air; or
>
> (c) where both types of exposure are concerned, a proportionate number of fibre-hours per millilitre of air;
>
> "adequate" means adequate having regard only to the nature and degree of exposure to asbestos and "adequately" shall be construed accordingly;
>
> "approved" means approved for the time being in writing by the Health and Safety Commission or the Health and Safety Executive as the case may be;
>
> "asbestos" means any of the following minerals, that is to say, crocidolite, amosite, chrysotile, fibrous actinolite, fibrous anthophyllite, fibrous tremolite and any mixture containing any of those minerals;
>
> "asbestos area" and "respirator zone" shall be construed in accordance with regulation 14;
>
> "control limit" means one of the following concentrations of asbestos in the atmosphere when measured or calculated by a method approved by the Health and Safety Commission, namely—
>
> (a) for asbestos consisting of or containing any crocidolite or amosite—
>
> (i) 0.2 fibres per millilitre of air averaged over any continuous period of 4 hours,
>
> (ii) 0.6 fibres per millilitre of air averaged over any continuous period of 10 minutes;
>
> (b) for asbestos consisting of or containing other types of asbestos but not crocidolite or amosite—
>
> (i) 0.5 fibres per millilitre of air averaged over any continuous period of 4 hours,
>
> (ii) 1.5 fibres per millilitre of air averaged over any continuous period of 10 minutes;
>
> "the Executive" means the Health and Safety Executive.

> …
>
> 15.—(2) The employer shall keep a suitable record of any monitoring carried out in accordance with paragraph (1) and that record or a suitable summary thereof shall be kept—
>
> (a) in a case where exposure is such that a health record is required to be kept under regulation 16, for at least 30 years [amended to 40 years by paragraph 6 of the Schedule to the Control of Asbestos at Work (Amendment) Regulations 1992];
>
> (b) in any other case, for at least five years."

29. There was no evidence that, for example, RR was exposed to a level that exceeded the action level. In those circumstances, there is nothing to say that the records should have been kept for 30 years (later amended to 40 years). Moreover, in our view, this cannot be met by the argument that, because there were no records, the appellant does not know if the action levels were exceeded: there was evidence from RR about his exposure and the experts on both sides were able to calculate that exposure in figures. If it was said that the action levels were exceeded, that case needed to be pleaded and proved by way of factual and expert evidence. It was not.

30. Secondly, on the basis that it has not been shown that RR was exposed to a level beyond the action level, any air monitoring records would only have been kept for 5 years. In those circumstances, since Mrs Johnstone left her employment at the garage in 1989, there would have been no records relevant to her employment that would and should have been kept by the garage beyond 1994/1995. So any such documents would have been destroyed more than two decades before the trial.

31. To get round this obstacle, the appellant's argument has to be that, since RR left the garage in full time employment in 1995, the 30 year rule (later amended to the 40 year rule) was triggered in his case, and that therefore there would have been documents relating to him at the trial. On that basis, therefore, the adverse inference is said to arise for a period when Mrs Johnstone was no longer employed by the garage, arising out of hypothetical records in respect of a third party (RR). That seems to us to be too tenuous an argument on which to base the draconian adverse inference now sought.

32. Thirdly, the argument about the records is very limited in time. The 1987 Regulations came into force on 1 March 1988. That was towards the end of Mrs Johnstone's employment at the garage: she left between 12 and 18 months thereafter. That doubtless explains why, although this limit had not been put clearly to the judge, on appeal Mr Snowden was careful to refer only to the last 12-18 months of Mrs Johnstone's employment. In that way, the obligation in respect of records only existed for 20% of the overall period of her employment. It is impossible to see how that would again justify the drastic consequences for which the appellant now contends. This is particularly because the evidence showed that, as the 1980's wore on, asbestos-lined brakes were replaced by disc brakes, which in all probability would have reduced RR's (and therefore Mrs Johnstone's) exposure to asbestos anyway.

33. Fourthly, precisely what adverse inference he should draw – how it would work and what effect it would have – was not made clear to the judge. It was not explained in the appellant's lengthy closing submissions at trial. As set out at paragraph 25 above, the

judge understood that he was being asked generally to use the adverse inference to prefer the appellant's expert evidence over that of the garage. He declined to do that for the reasons I have cited. In my view, no criticism can be made of that passage in the judgment.

34. Fifthly, we consider that the argument in the present case seeks to put the judge into a straitjacket, in that it seems to require him to make findings of fact which were contrary to the facts as he found them to be. That was apparent from Mr Snowden's submissions in reply, when he put the point in a new way, arguing that what the judge should have done was to take RR's witness statement at face value, and not subject it to any kind of scrutiny or interpretation at all. This would have meant that, for example, when RR said that he worked with asbestos one day a week, the judge would have been obliged to find that he worked with asbestos for 8 hours solidly on that day. The judge had of course rejected that, finding instead that it would only have been a percentage of that day in which he was exposed to asbestos dust. In this way, the inference sought runs completely counter to the findings of fact made by the judge.

35. We reject this new way of putting the adverse inference case. It would have required the judge to make findings of fact that he did not accept on the evidence, and prevented him from making findings of fact which he thought were appropriate and sensible. We consider that Mr Platt was right to say that it was less an adverse inference argument, and more an attempt at predetermination which would have rendered a large part of the trial (the factual evidence and the oral evidence of Mr Stear and Mr Chambers) wholly otiose. That goes far beyond the principles established by the case law and would, in our view, lead to an illogical and unsound result.

36. The expert evidence of Mr Stear, which the judge preferred, was (as the judge rightly noted at [85]) closely aligned to the judge's own findings of fact. It would have been wrong in principle, and contrary to common sense, for the judge to have made those detailed findings, only then to ignore them and accept the calculations put forward by Mr Chambers which, as the judge said, were calculated on the wrong factual assumptions.

37. We do not suggest that adverse inferences can never be applied to expert evidence. But for the reasons that we have given, the adverse inference submission in this case makes a leap of logic which is unsustainable. The judge was obliged to do his best on the material that he had and to calculate the exposure to RR, and therefore the exposure to Mrs Johnstone. He did that on the basis of a number of findings of fact. Mr Chambers' calculations were far removed from those findings; Mr Stear's calculations were much closer. In those circumstances, the adverse inference principle cannot extend to an effective deletion of those findings of fact and an uncritical acceptance of Mr Chambers' calculations.

38. Finally, we note that, in any event, this is not a case in which there were two different versions of the facts put forward by the opposing parties, with the judge having to choose between them, and where one side had been hampered by the other's failure to adduce oral or written evidence. It is in that situation – as occurred in *Keefe* - where the adverse inference principle is of most relevance. It is in that situation where the court can look benevolently on the claimant's evidence and critically on the defendant's evidence. Here, there was no factual evidence from the garage at all so, unlike in *Keefe*, there was no conflicting evidence of fact on which the court could look critically. The

main evidence of fact came from RR, the appellant's own witness. What the judge had to do was to translate RR's general evidence into realistic findings as to his daily/weekly exposure to asbestos. That is what he did.

39. For all those reasons therefore, we reject Ground 5 of the appeal. That means that the remainder of this judgment is concerned only with the last stage of the judge's analysis, namely the method he adopted to establish that the respondent's breach of duty did not cause Mrs Johnstone to develop mesothelioma.

40. In order to explain Grounds of Appeal 1-4, and our conclusions in respect of them, it is necessary to understand, first, something of the legal framework of causation within which this claim sits and, second, the methods for which the parties respectively contend in determining causation within that framework.

5. The Legal Background

41. In most areas of the law of tort, a claimant will have a cause action against a defendant only if they can show that, on the balance of probabilities, their injury was caused by the defendant's breach of duty. That usually requires the claimant to prove that, but for the defendant's breach of duty, they would not have suffered the injury. In some cases, where injury is caused by the cumulative effect of the inhalation of dust, the "but for" test is modified so that the claimant will have a cause of action if they can show that the defendant's breach of duty made a material contribution to their injury. All of this is explained in detail in the Supreme Court's decision in *Sienkiewicz v Grief (UK) Ltd* [2011] UKSC 10; [2011] 2 AC 229 ("*Sienkiewicz*"): see the judgment of Lord Phillips of Worth Matravers at [12] to [17].

42. A special rule of causation is applied, however, in cases of the hideous and inevitably fatal disease of mesothelioma: where a claimant has developed mesothelioma and it is known that they were exposed to the risk of inhaling asbestos dust as a result of the negligence of the defendant, then the defendant is liable if they have materially increased the risk of the claimant contracting the disease: see Lord Phillips in *Sienkiewicz*, at [107].

43. The rule exists because of ignorance about the biological cause of mesothelioma. It has been accepted, since the House of Lords' decision in *Fairchild v Glenhaven Funeral Services Ltd* [2002] UKHL 22; [2003] 1 AC 32 ("*Fairchild*"), that this renders it impossible to prove causation on the traditional "but for" basis. At [19] of *Sienkiewicz*, Lord Phillips summarised what was then currently known about mesothelioma, based in part on medical science and in part on epidemiological studies (in particular, a study carried out by Peto and Rake on *Occupational, domestic and environmental mesothelioma risks in Britain*, published in 2009 by the Health and Safety Executive ("The Peto Report")), as augmented by recent judicial authority:

> "(i) Mesothelioma is always, or almost always, caused by the inhalation of asbestos fibres. (ii) A significant proportion of those who contract mesothelioma have no record of occupational exposure to asbestos. The likelihood is that in their case the disease results from inhalation of asbestos dust that is in the environment. There is, however, a possibility that some cases of mesothelioma are "idiopathic", i e attributable to an unknown

> cause other than asbestos. [Counsel for the appellant in that case] submitted that the Peto Report indicates that this is more than a possibility, but I do not so read it. I do not, however, think that it matters whether some cases of the disease are idiopathic. (iii) The more fibres that are inhaled, the greater the risk of contracting mesothelioma. (iv) There is usually a very long period between the exposure to asbestos and the development of the first malignant cell. Typically this can be at least 30 years. (v) There will be a lengthy period between the development of the first malignant cell and the point at which the disease can be diagnosed. At the time of Fairchild this was thought to be ten years, but is now thought to be at least five years. During this period, further exposure to asbestos fibres will have no causative effect. (vi) The mechanism by which asbestos fibres cause mesothelioma is still not fully understood. It is believed that a cell has to go through six or seven genetic mutations before it becomes malignant, and asbestos fibres may have causative effect on each of these. (vii) It is also possible that asbestos fibres have a causative effect by inhibiting the activity of natural killer cells that would otherwise destroy a mutating cell before it reaches the stage of becoming malignant."

44. At [21] to [58] of his judgment, Lord Phillips traced the development of the rule from the decision of the House of Lords in *McGhee v National Coal Board* [1973] 1 WLR 1 ("*McGhee*") through to *Fairchild*, where it was applied in the case of two or more tortfeasors by whose negligence the claimant was exposed to the risk of inhaling asbestos dust. The development in *Sienkiewicz* was to apply the same principle in the case of only one known tortfeasor.

45. At [107], Lord Phillips considered what constitutes "a material increase in risk". He noted that the parties were agreed that the insertion of the word "material" was intended to exclude an increase in risk that was so insignificant that the court will "properly disregard it on the de minimis principle". He rejected the submission that exposure should be immaterial if it did not at least double the risk. At [108], he said:

> "I doubt whether it is ever possible to define, in quantitative terms, what for the purposes of the application of any principle of law is de minimis. This must be a question for the judge on the facts of the particular case. In the case of mesothelioma, a stage must be reached at which, even allowing for the possibility that exposure to asbestos can have a cumulative effect, a particular exposure is too insignificant to be taken into account, having regard to the overall exposure that has taken place."

46. For reasons which are easily understood, there has been reluctance by the courts to determine a quantitative figure as to what constitutes *"de minimis"* in the context of mesothelioma claims. Cited in this appeal was the case of *Bannister v Freemans Public Limited Company* [2020] EWHC 1256 (QB) ('*Bannister*'), in which the annual risk of the deceased's assumed exposure of around 1 in 50 million was immaterial, but the judge was understandably reluctant to determine a threshold figure.

47. In *Willmore v Knowsley MBC* [2009] EWCA Civ 1211; [2010] E.L.R. 227, one of the cases the subject of an appeal in *Sienkiewicz*, Sedley LJ agreed with the approach of the trial judge, Nicol J, at [12]:

> *In my judgment there is no discernible error either in the judge's approach to the question whether the claimant's exposure had been minimal or material… It has to be remembered that where asbestos is involved, all exposure constitutes a risk of harm.*

Nicol J had adopted unchallenged medical evidence that concluded that significant exposure would be *"a level above that commonly found in the air in buildings and the general outdoor environment"*. At [23], Sedley LJ stated:

> *Once exposure above a minimal level is found, as Nicol J found it to be in each separate instance, a risk of harm is established. I recognise that there is much in the judge's findings which depends on probability and inference, so that none of his findings was a foregone conclusion even on the primary evidence. But, for the reasons I have given, he was entitled to find a likelihood of significant exposure from two of the three sources he identified, and that, in the absence of any error of law, is enough to sustain his judgment.*

48. The Supreme Court in *Sienkiewicz* did not overturn the finding as there was no error of law in determining that the *Fairchild* principle applied which was the main issue in the appeal [165]. The Court was hesitant to overturn any findings of fact in respect of causation, despite noting that Nicol J had drawn *"very generous"* inferences in the claimant's favour [166]. These findings were described by Lord Mance as being *"slender and speculative"* [195] and by Lady Hale as *"truly heroic"* [173].

49. We turn to consider how a claimant might establish that their risk of contracting mesothelioma was materially increased by the negligence of the defendant.

6. Establishing causation according to the special rule

50. The starting point here is *Sienkiewicz* itself. Having stated the test as being whether the defendant has materially increased the risk of the victim contracting the disease, Lord Phillips said at [111]:

> "The reality is that, in the current state of knowledge about the disease, the only circumstances in which a court will be able to conclude that wrongful exposure of a mesothelioma victim to asbestos dust did not materially increase the victim's risk of contracting the disease will be where that exposure was insignificant compared to the exposure from other sources."

51. In other words, the only practical way to establish a material increase in <u>risk</u> was to show that there was a material increase in the victim's <u>exposure</u> to asbestos.

52. This linking of risk to exposure is also adopted by Lord Brown, who said at [175]:

> "The present position, exemplified by the facts of these very appeals, can be simply stated as follows: any person who negligently or in breach of

> duty exposes another more than minimally to the inhalation of asbestos fibres will be liable to make full compensation if that other develops mesothelioma…"

53. The appellant in this case contended before the judge that an increase in material risk was established, on the basis adopted in *Sienkiewicz*, because Mrs Johnstone's exposure to asbestos fibres over the course of her life was materially increased by her exposure to asbestos while working at the garage.

54. The judge, however, preferred the approach for which the respondent contended, which involved looking at a range of evidence and data sources in order to estimate directly the increase in *risk of contracting mesothelioma* caused by Mrs Johnstone's exposure to asbestos while working at the garage. The respondent also suggested a further approach (which the judge did not adopt), which relied on expert medical opinion to establish that the risk of exposure from Mrs Johnstone's time at the garage was insignificant in absolute terms.

55. The parties, and the judge, labelled their rival approaches as Method 1, 2 and 3. We prefer not to use these labels, as they give the false impression that these form distinct and established methodologies. For convenience, we will refer to the appellant's preferred approach as the "exposure/risk approach", as it equates risk of increase in contracting the disease with increase in exposure. We will refer to the approach adopted by the judge, and advocated by the respondent, as the "direct risk assessment approach", and to the respondent's alternative approach as the "absolute risk approach".

The exposure/risk approach

56. This approach requires two matters to be established: (1) Mrs Johnstone's estimated exposure to asbestos during her time working at the garage (which we will call the "known occupational exposure"), and (2) her estimated exposure to asbestos fibres in any event throughout her life (which we will call the "environmental exposure").

57. Both the known occupational exposure and the environmental exposure are expressed as the number of f/ml years ("f/ml-y"). This means the number of asbestos fibres per millilitre of air over the course of a year.

58. The increase in risk of contracting mesothelioma is then calculated by dividing the figure for known occupational exposure by the figure for environmental exposure, expressing the result as a percentage.

59. Mrs Johnstone's known occupational exposure was found by the judge to fall within a range of 0.001 f/ml-y to 0.002 f/ml-y. A year, in this context, means 1,920 hours, based on a working day of 8 hours and a 48-week working year. This finding was based on the expert evidence of the respondent's occupational hygiene expert, Mr Stear, which the judge preferred on this issue over that of the appellant's expert, Mr Chambers. There is no appeal from this finding, other than that under ground 5 which, for reasons given above, we reject.

60. The figure for environmental exposure was found by the judge to be 0.046 f/ml-y. This was based on the expert evidence of Professor Jones, which the judge accepted, and against which there is no appeal. In this context, the length of the relevant "year" varies

across the different aspects of Mrs Johnstone's life. For example, during her school years it is taken to be 870 hours outdoor, 1200 hours indoors (school), and 6690 hours indoors (residential), whereas from age 17 to 50 it is taken to be 870 hours outdoors and 7890 hours indoors (residential and commercial).

61. On the basis of these figures, the resulting increase in exposure was between 2% (0.001/0.046 x 100) and 4.3% (0.002/0.046 x 100). The appellant contends that this is a material increase. Although the respondent did not formally agree, no argument against this proposition was advanced before us.

The direct risk assessment approach

62. As we have noted, this is based on a comparison between the risk of developing mesothelioma, arising from (1) Mrs Johnstone's risk of contracting mesothelioma from working at the garage, which we will refer to as the "known occupational risk" and (2) any other factors, which we will refer to as the "background risk".

63. As presented to the judge, it relies principally on two published studies. The first, which seeks to identify the risk of developing mesothelioma from exposure to different forms of asbestos and at different levels of exposure, is a paper by Hodgson J.T. and A. Darnton in 2000 entitled "The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure" (the "H&D Study"). The other is the Peto Report (referred to in *Sienkiewicz*), which seeks to identify the background risk of developing mesothelioma from any other source.

64. The H&D Study contained a "meta-analysis" of various studies of mortality risk from exposure to asbestos. These studies were all of exposure to high doses of asbestos. It compared the risk of exposure as between different forms of asbestos fibre. It concluded that chrysotile, to which Mrs Johnstone was exposed, is the least toxic form of the three principal commercial asbestos types: the risk of contracting mesothelioma from it, as compared with the other two principal types, can be expressed in the ratio:

1 (chrysotile) : 100 (amosite): 500 (crocidolite)

65. Of most relevance to this appeal, however, is the attempt in the H&D Study to extrapolate from the established data, which examined the risk of contracting mesothelioma from exposure to the three asbestos types at very high levels, to exposure at levels of between 100 and 1000 times lower.

66. Table 11 in the H&D Paper sets out estimated risk levels for developing mesothelioma from the principal types of asbestos fibre, based on extrapolating down (from the high dosages seen in the studies relied on) by various factors. At cumulative exposures of 0.1 f/ml-y, the risk for chrysotile is estimated to be "probably insignificant", with the highest arguable estimate of 4 deaths per 100,000 exposed. At cumulative exposures of 0.005 f/ml-y and lower, the risk for chrysotile is estimated to be "insignificant". That contrasts with the risk from exposure to crocidolite, where the best estimate is 10 deaths for 100,000 exposed.

67. We will need to come back to this in considering ground 1 in more detail but, in short, the appellant contends that the judge should have concluded – based on the evidence of Professor Norrie – that to extrapolate from the data based on results at high levels of

exposure to asbestos to the very much lower exposure in the case of Mrs Johnstone is "close to useless" and "as good as tossing a coin."

68. The starting point in the direct risk assessment approach is the same as that in the exposure/risk correlation approach, namely to estimate Mrs Johnstone's *exposure* to asbestos while working at the garage. As noted above, the judge accepted Mr Stear's evidence on this, being between 0.001 f/ml-y and 0.002 f/ml-y. In fact, the respondent's environmental and occupational toxicology expert, Professor Jones, whose calculations were adopted by the judge, took as his starting point the figure most favourable to the appellant within that range, 0.002 f/ml-y.

69. The next step is to use the model set out in the H&D Study to estimate the risk of contracting mesothelioma from that level of exposure. On Professor Jones' calculations, this resulted in the following range:

> Best estimate: a mortality rate of 0.022 per 100,000
> Lowest arguable: a mortality rate of 0.0006 per 100,000
> Highest arguable: a mortality rate of 0.22 per 100,000

70. The appellant's epidemiological expert, Professor Norrie, accepted that these results are obtained *if* the model in the H&D Study is applied. The issue between the parties was whether it was appropriate to do so.

71. The next step is to identify the background risk for Mrs Johnstone, by reference to the findings in the Peto Report. According to this, there is a background risk for people, like Mrs Johnstone, born in the 1940s, of developing mesothelioma of 1 in 1,000.

72. There are a number of sources of such risk: unknown occupational exposure (i.e. because of working in an environment where asbestos was present but without realising it); environmental exposure (which varies as between an urban or a rural environment); and idiopathic risk. It was common ground that – apart from while working at the garage – Mrs Johnstone was not exposed to asbestos during any other occupation. Accordingly, it was necessary to reduce the headline risk in the Peto Report by a factor. Professor Jones, whose calculation the judge endorsed, factored in a figure for Mrs Johnstone's background risk which was half the headline risk identified in the Peto Report, and used the figure of 0.5 in 1,000.

73. We will need to return to this aspect of the calculation when considering ground 2, because whether it was correct to use the figure of 0.5 in 1,000, in light of the totality of Professor Jones' evidence, is hotly disputed.

74. Sticking for the moment with the figures adopted by the judge, the final step in the direct risk assessment approach is to divide the known occupational risk by the background risk, and express it as a percentage. The judge did not himself set out the calculation he used, but set out *parts* of the calculation in Professor Jones' report. Using the "best estimate" figure for the known occupational risk, and based on Mr Stear's estimate of exposure (i.e. 0.022 per 100,000), he concluded that this resulted in a percentage increase of less than 0.1%: see [60] of the judgment.

75. In fact, Professor Jones' calculation, based on the above figures, and taking 0.5 per 1000 as the figure for background risk, resulted in a percentage increase of 0.04%:

0.0022/50 x 100 = 0.044%

76. At [113], the judge concluded that the increase in risk was "0.1% or less". Such an increase was found by the judge to be *de minimis* and thus not material. The appellant accepts that, if that is the correct calculation, then the resulting percentage increase is not material. Various aspects of the calculation are, however, disputed.

The absolute risk approach

77. The judge did not reach a conclusion on the absolute risk approach. By its respondent's notice, the respondent contends that it nevertheless supports the judge's conclusion that there was no material increase in risk.

78. This approach starts with estimating Mrs Johnstone's risk of contracting mesothelioma from working at the garage in the same way as the direct risk assessment approach: using the model for extrapolating risk from the known data in the H&D Study. Then, however, rather than comparing that with background risk, it simply relies on the evidence of a medical expert (in this case the respondent's medical expert, Dr Moore-Gillon) that this was "medically insignificant".

79. The respondent contends that this approach was endorsed in *Bannister*. At [168] the test was expressed as:

> "a dose of asbestos which was properly capable of being neglected could be defined as a dose which a medical practitioner who is aware of the medical risks would define as something that the average patient should not worry about."

80. At [175], the deputy judge in *Bannister* found that this test was a "helpful and appropriate means of determining whether there is a material increase in risk."

81. The appellant objects that this approach is wrong in law, because it fails to apply the special rule applicable in mesothelioma cases that liability is determined wherever there is a material *increase* in risk as a result of the defendant's breach of duty. However small the known occupational risk may be in absolute terms, if it is a more than a *de minimis* increase in the background risk, then liability ought to be established.

A (final) preliminary point

82. Before turning to the specific grounds of appeal, it is important to state what this appeal is *not* about. It is not about deciding whether the direct risk assessment approach is, generally, a valid and appropriate method. Whether it is or not is heavily dependent on the evidence of experts in various fields of study, including statistics, epidemiology, toxicology and medicine. It is not for an appeal court to assess such evidence, and we were not asked to do so. Indeed, we have been taken only to isolated and small sections of the expert evidence that was before the judge. That was for the purpose of answering the question which is before us on this appeal, namely whether the judge's conclusions were open to him on the basis of the evidence – including critically the expert evidence – that was adduced by the parties in this case.

7. Ground 1: The Judge's Treatment of Professor Norrie's Evidence

83. The appellant's core argument under ground 1 is that the judge was wrong to find that Professor Norrie's evidence was that, with the exercise of significant caution, it was safe to extrapolate 100 to 1000 times away from the data in the H&D Study.

84. This is premised on the contention that the judge accepted Professor Norrie's evidence on the validity of the H&D Study, but made a fundamental error in that he misunderstood Professor Norrie's evidence.

85. The legal test on an appeal against a finding of fact is summarised by Lewison LJ in *Volpi v Volpi* [2022] EWCA Civ 464 at [2]. In essence, an appeal court should not overturn a finding of fact unless satisfied that the judge below was plainly wrong: *McGraddie v McGraddie* [2013] UCSC 58. It does not matter whether the appeal court considers that it would have decided differently. The finding must be one that no reasonable judge could have reached. It should be assumed that the trial judge had considered all evidence before them, and the judge's balanced consideration of the evidence should not be interfered with unless their conclusion was rationally insupportable. The decision should not be *"picked over or construed as though it was a piece of legislation or a contract"*.

86. The appellant notes that the judge expressly recorded a number of passages from Professor Norrie's evidence which, taken together, strongly criticised using the model in the H&D Study for extrapolating down to the levels of exposure found in this case. Thus, the judge recorded Professor Norrie's views as including:

> "H&D's primary purpose was not to deal with low doses…"
>
> "[t]he problem comes when trying to apply it to exposures anything between 100 and 1000 times smaller than the data on which the model is built…"
>
> "the problem is 'untestable assumptions…'"
>
> "Professor Norrie had never seen extrapolation down 100 or 1000 times from reliable data….",
>
> "[he] cautioned against accepting the view of others that H&D is 'the best we have got' so that it is safe to use".
>
> "[he] considered H&D not fit for purpose for extrapolating down."
>
> "As to H&D, he too made reference to the WATCH Committee's cautioning about the use of that meta-analysis, with a detailed critique setting out the reliability difficulties of using the paper in the way suggested in this case…"

87. This last reference is to a paper from the WATCH Committee of the HSE, published in February 2011. Having noted that previous decisions of the WATCH Committee had concluded that the H&D Study model was "generally robust" for different fibre types and different exposure levels within, and reasonably close to, the exposure ranges within which observable data are available, the paper then noted various continuing uncertainties, and concluded:

> "WATCH considers that all of these uncertainties impose limitations on the reliability of risk estimates produced by the H&D model, particularly when it is extrapolated to exposure situations and populations beyond those covered by observed data. Hence WATCH confirms the statement in its 2008 conclusion that risk estimates derived by extrapolation of the model should not be taken to be reliable absolute risk values. The limitations on the reliability of risk estimates derived using the H&D model become more pronounced the further the model is extrapolated from the occupational exposure scenarios and data on which it is based.
>
> Therefore, as recommended in the WATCH position of 2008, WATCH considers that extrapolated risk estimates might be most useful as rough indicators of the magnitude of risk that might be involved in different situations; and hence the relative extent of concern and prompting towards risk management action that can be justified in different situations. WATCH observes that deriving risk estimates by extrapolating the H&D model is a straightforward process; however, there was a variation of opinions across the committee, with no clear majority or consensus view as to the appropriateness of presenting such estimates in numerical form or using them for decision-making in a way that might be taken by others to imply confidence in their numerical accuracy."

88. The appellant also relies on other passages in the cross-examination of Professor Norrie, in which he said:

> "A useless model is as good as tossing a coin … I would not use a model that was close to useless."
>
> "I mean, I do not want to be melodramatic, but you probably could get pretty much any answer you wanted, depending on how you did the extrapolation."

89. In light of this evidence, the appellant contends that the following conclusion of the judge (at [110]) is based on a demonstrable misunderstanding of the evidence:

> "I accept the thrust of Professor Norrie's evidence which I interpret to be the exercise of significant caution when seeking to extrapolate down to low doses from H&D's model equation. His generalised reference to any useless model being as good as 'tossing a coin' seemed to me to be an attempt to put into layman's terms the potential outcome if that significant caution were not exercised."

90. The respondent contends that the judge did not misunderstand Professor Norrie's evidence, which must be taken as a whole.

91. The respondent also contends that the judge in any event accepted the evidence of Professor Jones that, if approached cautiously, recognising all the inherent uncertainties, the H&D Study could be safely relied on to arrive at an estimate for the risk of contracting mesothelioma at the very low levels present in this case. Professor Jones, for example, said that "[H&D offered] the best guide that is available to the range of risks arising from a given low level of exposure to asbestos."

92. The judge summarised Professor Jones' evidence at [55] to [65] of the judgment, which included the following, relevant to the validity of extrapolating using the H&D Study model:

(a) So far as the H&D Study was concerned, he noted that there are considerable uncertainties in the risks estimated for low exposures by this model, but said:

> "However, in my view the authors have made reasonable scientific judgments in their interpretation and consequently the model does provide a reasonable picture of the range of risks that might be attributed to low levels of exposure to asbestos."

(b) He also referred to two other meta-studies, Bourdes and Marsh, which, albeit that they were based again on populations with unusually high levels of asbestos exposure, did not find a statistically significant elevation of malignant mesothelioma of the pleura in populations exposed only to chrysotile.

(c) He said in oral evidence that, bearing in mind all the uncertainties in the H&D Study it is necessary to look at other papers to try to put all comparisons before the court, to assist with how one might treat very large uncertainties.

(d) He understood the nervousness in respect of the H&D Study, but said that in using the model from which Table 11 in the paper is derived, which is non-linear, one gets more resolution and information than the table alone provides, particularly at low exposures.

93. At [110], the judge said that "Professor Jones did indeed, in my judgment, pay proper heed to the need for caution in addressing H&D. In his report and in his oral evidence he gave persuasive evidence about the formulations within his report and the range of calculations."

94. At [112], the judge concluded as follows:

> "I found Professor Jones' insightful observations and opinions on the issues of lifetime risk, his worked models and his conclusions highly persuasive."

95. The respondent also pointed to other parts of Professor Norrie's evidence, which it was submitted showed his views were more nuanced than the appellant suggested. These included:

(a) In the joint statement, he called the H&D Study "a lucid study with an excellent report."

(b) Also in the joint statement, his view as to the reliability of using the H&D Study model to extrapolate to low levels of exposure was stated as:

> "using the H&D 2000 model may lead to either underestimation or overestimation of the risk of mesothelioma given a specified very low exposure. He is happy to clarify his position that if the decision has been taken that to use H&D model for this purpose (extrapolating to risk at very low exposures) is appropriate, then what has been done by Professor Jones appears sensible and reproducible."

(c) He had accepted in cross-examination that the authors of the H&D Study were mindful of uncertainties when compiling lower dose assumptions, and referred to the H&D Study as a "very very good paper", that if he had done it his team would have been "rightly proud of it", as it was a "fine example of epidemiological study"

(d) Professor Norrie would not accept, in cross-examination, that the H&D Study was the "best guide that is available" (as Professor Jones had said), but in explaining why that was a very difficult question to answer, he said:

> "As I say, at the time, they took the data that was available and presented it in a meta-analysis that seems to be, you know, first class. They done what I have repeatedly said is a good and reputable treatment of all the data. They have explained the model that they have come up with and, to my mind, apart from the minor criticisms that I have just made, they have done a good job of representing the findings from that. So that, say, for example, myself, as a very experienced epidemiologist, could pick that paper up and get off to a good start with it, I understood what they have done, I can go back to it on repeated occasions and qualify my understanding of it. So, that, for me, is job done. But you asked the question is it the best available … I think it is not knowable".

(e) He went on to explain that he found it "very philosophically difficult" to deal in absolutes such as "best", but said that "in the year 2000" it was "the best on the block".

96. As to the suggestion that Professor Norrie had described the H&D Study as "close to useless" and "as good as tossing a coin", it is important to see this in the context of the questions and answers which preceded it.

97. Professor Norrie was asked to talk through the methodological approach in the H&D Study. He started by saying it was important to understand that he had a "high opinion" of it. He then said that its primary purpose "was not, in any way, shape or form to deal with low doses". While he did not have any problem with it as a model of the relationship between exposure and risk "for that range of exposure", the "problem comes when you try and then apply it, lock stock and barrel, to a bunch of exposures which are possibly anything between 100 and 1000 times smaller."

98. He said that his overriding point, as a statistician who had spent a considerable amount of time modelling all sorts of circumstances, was that "it is very possible to underestimate or overestimate the risk, depending on how you deal with that extrapolation". The passage relied on by the appellant follows his discussion about whether it was "the best that we have got". He said: "But you have got to be careful with that argument about: "okay, it is the best that we have got and therefore we are safe to proceed". That is the inference. In a lot of practical modelling, which in effect, this is predictive modelling, it is just about trying to predict back a way rather than forwards. A useless model is as good as tossing a coin. That is a statistically accurate characterisation. Now, in my work, I would not use a model that was close to useless."

99. When seen in this context, we think the judge was entitled to conclude that Professor Norrie was not as dismissive of using the model in the H&D Study in relation to much lower rates of exposure as the appellant contends. Accordingly, although Professor Norrie at times spoke in strong terms about the risk of relying on extrapolation from the data used in the H&D Study, we consider the judge was entitled to reach the view he did as to the overall thrust of his evidence.

100. Moreover, to the extent that there was a difference of degree between the experts as to the amount of caution to exercise when relying on the H&D Study, it is clear that, as the respondent submitted, the judge accepted Professor Jones' evidence, to the effect that it was appropriate to rely upon the model within the H&D Study for estimating the risk of contracting mesothelioma from the very low levels of exposure found in this case, provided this was done with caution. On that basis, therefore, the judge was entitled to conclude that there was very little between Professor Jones and Professor Norrie on this issue. And to the extent that there was a difference, the judge was plainly entitled to prefer the evidence of Professor Jones.

101. We reject the appellant's contention that the evidence of Professor Norrie should have been preferred to that of Professor Jones because Professor Norrie is a statistician. Firstly, at trial it was not suggested that Professor Jones was not capable of commenting upon the relevant issues because he is not a statistician. Secondly, as the judge noted at [109], Professor Jones provided evidence resulting from many years of practical application. To that extent, we regard the qualifications of the respective experts as being of secondary importance.

102. Accordingly, we reject the first ground of appeal.

8. Ground 2: The Calculation of Background Risk

103. The first point raised by this ground is a relatively short one. It relates to the second aspect of the calculation used in the assessment of risk approach, namely the appropriate figure for background risk. In particular, what sub-division of 1 in 1000 it is appropriate to use in the case of Mrs Johnstone – it being accepted that of the three constituent groups that make up the background risk (unknown occupational risk, environmental risk and idiopathic risk), the first (unknown occupational risk) is to be excluded.

104. In the joint report of the experts, Professor Jones is recorded as accepting that there is no clear way of dividing the risk of 1 in 1,000 between the three sources of risk, but "[f]or comparison with risks estimated from occupational exposure Prof Jones adopts a

figure of 50% [i.e. 0.5 in 1000] for the combination of genuinely spontaneous and ambient exposure in order to make a comparison."

105. That formed the basis of the calculation which the judge adopted, in arriving at his conclusion that the increase in risk was 0.04%.

106. The appellant rightly points out, however, that in the course of his oral evidence, Professor Jones rowed back from this considerably. He re-affirmed his evidence that there is no clear way of dividing the risk of 1 in 1000 between the three sources. He acknowledged that he had been mistaken to say that the Peto Report indicated that 0.3 out of 1000 female cases were idiopathic, recognising that is said this accounted for "at most" a third of cases. Most significantly, in re-examination, he said:

> "I mean, having thought about it quite a bit during trial, I think I would probably now say that 0.5 is too high but that maybe taking account of (inaudible) figure for (inaudible) spontaneous, probably it's going to be somewhere in the region of 0.1 to 0.5, so somewhere in that region. I think 0.5 probably is rather too high, although, of course, it depends on (inaudible) risk. Yes, somewhere in the region of 0.1 to 0.5 would be a range."

107. The judge recorded Professor Jones' change of heart at [63] of the judgment:

> "Having thought that 0.5 was a little too high, and taking account of spontaneous cases the figure would be somewhere in the region of 0.1 – 0.5, depending on the magnitude of the environmental risk."

108. The appellant's case is that the judge did not carry this through to his conclusion at [59] and [60] that the increase in risk was less than 0.1%.

109. We accept that this is a well-founded criticism. The judge did not independently calculate the "less than 1%" addition to risk, but refers to that being the conclusion from Professor Jones' report. Because that itself was based on the figure of 0.5 per 1000, it is reasonable to conclude that the judge failed to take into account Professor Jones' change of mind over the applicable percentage.

110. The respondent, however, makes two points in response. First, that the judge relied on the evidence of Dr Moore-Gillon to support the use of 0.5 in 1000. Second, that even if he had taken account of the change in Professor Jones' evidence, it would have made no difference to his conclusion.

111. Mr Platt illustrated his second point as follows. Assuming the judge should have adopted Professor Jones' evidence that the background rate was a range between 0.1 and 0.5 in 1000, it would have been reasonable to take the midpoint of that range in testing materiality. The midpoint is 0.25 in 1000, or 25 in 100,0000. Plugging that number into the relevant calculation still produces, for the increase in risk, a figure of less than 0.1%.

$$0.022/25 \times 100 = 0.088\%$$

112. Mr Swodoba's first answer to this, given in reply, was to rely on Professor Jones' evidence in cross-examination that "there is a temptation to produce a central value but in this case you simply cannot." He submitted that one should therefore test materiality by reference to all points within the range, including the lowest point, 0.1%. That, however, only gets the appellant so far. Simply plugging 0.1 in 1000 into the calculation still produces an increase in risk which is only 0.22%:

$$0.022/10 \times 100 = 0.22\%$$

113. Mr Swodoba did not suggest that this was a material increase, and we were not shown anything to suggest that it had been argued before the judge that this was a material increase. He submitted in his oral reply, however, that account should taken of the fact that both the numerator (known occupational risk) and the denominator (background risk) consisted of a range, and that somewhere along a graph showing all the possible permutations of calculating the percentage increase of the known occupational risk range over the background risk range, the result will be a material increase.

114. This is self-evidently correct as a matter of mathematics, and on the assumption (which as noted above was not challenged) that an increase of 2% is material. That is because taking the highest figure for occupational risk (0.22 per 100,000) and dividing it by the lowest figure for background risk (10 in 100,000) the resulting increase is 2.2%.

115. There are a number of insurmountable difficulties with this argument. First, it is far from self-evident that materiality can be established by basing the calculation of percentage increase on the most extreme end of two ranges (both being the most favourable to one side). Since the point was raised for the first time in reply, the respondent was not given the opportunity to respond to it. Second, we were not assisted by any analysis as to *where* along the spectrum of all the possible permutations, the point of materiality would be met, and whether it was only at the outer limits of that spectrum. Third, and most importantly, these points – in particular the contention that at some point on the spectrum of the possible permutations the increase becomes material – do not appear to have been canvassed with the judge. There is nothing in the judgment which addresses either (1) the question of principle (is it sufficient that, somewhere within the spectrum of possible permutations produced by comparing one range of figures with another range of figures, there is an increase that could be described as material?) or (2) the question where on that spectrum the point of materiality is encountered. We were not shown any written argument or the transcript of oral argument below where these points were raised.

116. According to the appellant's written closing submissions at trial, the appellant deployed Professor Jones' statement in cross-examination, that it was impossible to adopt a "central value" in support of a different contention. Namely that "there is no sensible way to implement [the direct risk assessment approach]. This is an insurmountable issue." In other words, it was part of the argument for why the direct risk assessment approach should be rejected, in favour of the exposure/risk approach. We address that issue under ground 3 below. But for the reasons that we have set out above, we reject ground 2 of the appeal.

9. Ground 3: The Legal Issues In Respect Of The Competing Methodologies

117. Under this ground, the appellant firstly contends that the judge failed to consider two legal propositions advanced before him and that, had he done so, he would have been bound to resolve them in the appellant's favour.

118. The first legal proposition is that the direct risk assessment approach involves an improper use of statistics. The second proposition is that the creator of the risk that a claimant contracts mesothelioma must bear the consequences of any and all inherent evidential difficulties or uncertainties.

119. It is fair to say that the judge did not expressly address either of these propositions, although he implicitly rejected them. While we endorse the view that it is always necessary to treat statistical evidence with caution, we do not accept that either of the appellant's propositions is sound in law.

120. The first proposition is based on the endorsement by Lord Rodger in *Sienkiewicz* of a passage in Phipson on Evidence, now contained in the 20th edition at para 34-28: "where there is epidemiological evidence of association, the court should not proceed to find a causal relationship without further, non-statistical evidence."

121. That was said in the context of a discussion as to the use to which epidemiological evidence might be put. The discussion was obiter in view of the Court's conclusion that the *Fairchild* special rule of causation in mesothelioma cases applied to the case of a single tortfeasor. That meant, as Lord Rodger concluded at [161] of *Seinkiewicz*, that there was no room for equating a material increase in risk with "doubling the risk". At [163] he said:

> "Finally, nothing which I have said is intended to discourage the use of epidemiological evidence or to depreciate its value in cases where a claimant has to prove his case on the balance of probabilities. Far from it. Obviously, for example, epidemiology is likely to lie behind much of the evidence on which a court determines whether an exposure has materially increased the risk of the claimant developing a disease. Epidemiological evidence may also be relevant when deciding whether it would have been reasonable for a defendant to take precautions to avoid the risk of the claimant suffering a particular injury - say, the side-effect of a drug. And, of course - it must be emphasised once more - epidemiological and statistical evidence may form an important element in proof of causation. I have simply emphasised the point made by Phipson on Evidence, 17th ed (2010), para 34-27, that, unless a special rule applies, "Where there is epidemiological evidence of association, the court should not proceed to find a causal relationship without further, non-statistical evidence". In other words, since, by its very nature, the statistical evidence does not deal with the individual case, something more will be required before the court will be able to reach a conclusion, on the balance of probability, as to what happened in that case."

122. We do not think that this assists the appellant. Lord Rodger was addressing the question of establishing causation in the traditional sense by use of epidemiological evidence. We note that he prefaced his reference to Phipson on Evidence with "unless a special rule applies". The example he goes on to provide is where epidemiological evidence might be used to allow the judge "to conclude, on the balance of probability, that it was

the drug that caused the claimant's condition". In the case of mesothelioma, however, a special rule does apply, such that it is not necessary to establish on the balance of probabilities that the condition was caused by the defendant's tortious conduct. It is necessary only to show that the exposure materially increased the risk of developing the disease.

123. The other passages in *Sienkowicz* to which Mr Swoboda directed us do not take matters further:

(1) Lady Hale, at [172], said merely that "as long as [judges] correctly direct themselves that statistical probabilities do not prove a case, any more than their own views about overall probabilities will do so, their findings will be safe." She was also addressing, as made clear at the beginning of [170], a case where the Fairchild exception (i.e. the special rule which negates the need to establish causation) did not apply: she was explaining why "doubling the risk" was not an appropriate test of causation in such a case.

(2) Lord Mance, at [190], was also concerned with cases other than where the special rule applied. That is clear from the fact that he spoke of the risks of relying on statistical evidence to determine whether "it is more likely than not that the particular defendant was negligent or causatively responsible." That is not the question when resort is had to the special rule.

(3) Lord Dyson, at [218], similarly was referring to the fact that epidemiology could not "conclusively prove causation".

(4) Finally, in adding his own comment to the (obiter) debate about the use to which epidemiological evidence might be put, Lord Kerr also (at [204]), framed it in terms of misgivings about "the capacity of this type of evidence to prove that mesothelioma is more likely to have been caused by a particular exposure."

124. As Lord Rodger expressly acknowledged in the passage set out above, application of the special rule necessarily involves the use of epidemiology: "Obviously … epidemiology is likely to lie behind much of the evidence on which a court determines whether an exposure has materially increased the risk of the claimant developing a disease."

125. Accordingly, we find that the premise of the appellant's legal argument under the first limb of ground 3 is not made out. We are satisfied that the direct risk assessment approach did not involve an improper use of statistics.

126. The second proposition (that the creator of the risk of harm must bear the consequences of evidential uncertainties), the appellant contends, was breached because the judge took into account (in favour of the respondent) the fact that the type of asbestos to which Mrs Johnstone was exposed at the garage was chrysotile (the least toxic of asbestos types, albeit it was acknowledged that there were likely to be more toxic fibres mixed in it), but ignored the other uncertainties in the case, specifically that nothing is known about the types of asbestos fibres to which Mrs Johnstone may have been exposed in the rest of her life.

127. The foundation of this argument was principally the decision in *Fairchild*. Mr Swodoba relied, first, on Lord Bingham's approval (at [33]) of the following passage from Lord Wilberforce's speech in *McGhee*:

> "the employers should be liable for an injury, squarely within the risk which they created and that they, not the pursuer, should suffer the consequence of the impossibility, foreseeability inherent in the nature of his injury, of segregating the precise consequences of their default."

128. Lord Bingham endorsed this, noting that the policy in favour of compensating those who have suffered a grave harm outweighs the injustice of imposing liability on a duty-breaking employer who may not caused the harm.

129. This was supported, Mr Swoboda contended, by the other judges in *Fairchild*.

130. While we agree that the House of Lords in *Fairchild* approved the principle enunciated in *McGhee*, that does not support in our view the proposition of law for which Mr Swodoba contends. The consequence in *Fairchild* was that the court approved, as a matter of policy, the special rule of causation that a tortfeasor was liable, without having to establish causation, if it could be shown that it had materially increased the risk of the claimant contracting mesothelioma: see, for example, Lord Hoffmann at [67] ("I therefore regard *McGhee* as powerful support for saying that when the five factors I have mentioned [see [64] of Fairchild] are present, the law should treat a material increase in risk as sufficient to satisfy the causal requirements for liability"); and to the same effect, Lord Nicholls at [41], Lord Hutton at [114], and Lord Rodger at [155].

131. We find nothing in *Fairchild*, or the endorsement of it in *Sienkowicz*, to suggest that in applying the special rule, the tortfeasor must also bear the consequence of each element of evidential uncertainty in the case. As Lord Nicholls noted in *Fairchild* (at [43]) considerable restraint is called for in relaxing the threshold "but for" test of causal connection, and that such a relaxation is not intended "where a plaintiff has difficulty, perhaps understandable difficulty, in discharging the burden of proof resting on him." It certainly does not result in a reversal of the burden of proof: [110], per Lord Hutton.

132. The appellant also contended that this was part of a broader principle of law, found to apply in many contexts. Mr Swodoba referred us in this respect to *Drake v Harbour* [2008] EWCA Civ 25. In that case, Longmore LJ said, at [15], that where negligence was established, and the damage which occurred was of the sort that might be expected to occur from the nature of the work the defendant carried out, the court should "be prepared to take a reasonably robust approach to causation". At [28], Toulson LJ said much the same thing, describing the approach, not as a principle of law, but "a matter of applying common sense". The other cases cited to us (*Kennedy v Cordia (Services) LLP* [2016] UKSC 6; [2016] 1 WLR 597, per Lord Reed at [121]; *Roadrunner v Dean* [2003] EWCA Civ 1816, per Chadwick LJ at [29]; and *Phethean-Hubble v Coles* [2012] EWCA Civ 349, per Longmore LJ at [90]) were similarly examples of a court doing no more than adopting a common-sense approach to causation. There is no support in them for the more adventurous proposition of law for which the appellant contends in this case.

133. In any event, we do not accept the appellant's criticisms of the judge's use of epidemiological evidence, as a matter of fact, whether on the first or second of the

propositions for which the appellant contends. Addressing the first proposition, and the appellant's contention that the respondent's proposed use of the Peto Report involved an improper use of statistics such that it could not be adopted, we note that the Peto Report involved telephone interviews with 622 mesothelioma patients and 1420 population controls. The data was analysed and converted to lifetime risk estimate for Britons born in the 1940s.

134. The appellant submits that there is nothing in the Peto study which directly personalises it to Mrs Johnstone. The fact that she was female and was born in the 1940s indicates that she is within a group of many millions and that in itself is an insufficient link to be able to state that the report contains evidence which can be used to determine her counterfactual risk as opposed to an average for the population of people born in the 1940s. The appellant accepts that the report is the epidemiological evidence of association but states that it is being used to assess the environmental exposure risk for Mrs Johnstone in order to determine the causal relationship as to whether the mesothelioma can be attributed to her tortious exposure to asbestos or not.

135. As to the second proposition, reliance is placed upon the fact that the judge found there were "legion uncertainties". The appellant submits that the respondent sought to take advantage of some whilst ignoring others. The paradigm example relied upon being that the respondent sought to take advantage of Mrs Johnstone's known occupational exposure being to chrysotile (notwithstanding that the level of tremolite contamination is unknown) whilst overlooking the fact that the tortious exposure is the only known exposure and that there is no way of knowing whether environmental exposure had a higher or lower proportion of amphibole fibres. The respondent is said to seek to minimise the risk created by the tortious exposure but maximise the risk "but for the tortious exposure" by ignoring the uncertainty as to fibre type in environmental exposure. Other uncertainties included the potency of chrysotile relative to other asbestos types; unknown quantity of amphibole contamination in tortious exposure; synergy between fibre types; fibre dimensions of tortious and non-tortious exposure; and genetic factors which are likely to impact upon the risk attributable to the tortious exposure.

136. Professor Jones conceded that chrysotile can be contaminated with the more potent form of tremolite. In comparing the garage exposure to environmental exposure, as was implicit in the judge's findings, the court did not know where and how the environmental exposure arose and thus the nature of the fibre type component. The appellant contends that this is unfair. The direct risk assessment attempts to incorporate the fibre type because the risk identified in H&D is based on chrysotile. However, the direct risk assessment assumed a population statistic for the environmental exposure, without consideration to the fibre type composition of that exposure. The exposure/risk approach does not require the court to look at the fibre type of the environmental exposure and thus, the appellant contends, is more appropriate in this case.

137. It is the appellant's case that Professor Jones and Professor Norrie provided an assessment of the environmental exposure which, on the premise that exposure is a proxy for risk, allows for the comparison between environmental exposure risk and the tortious risk and a determination of whether the tortious risk is material. It is the reason why the exposure/risk approach should have been preferred by the judge.

138. The respondent accepts that epidemiology alone cannot be used as a sole measure of individual causation. However its use is frequent and important in many forms of disease litigation: *Holmes v Poeton* [2024] 2 W.L.R. 1029. It has long been viewed as an essential part of decision making on causation particularly where the court is considering issues of risk which are necessarily statistical rather than organic material contribution. Uncertainty in any assessment does not devalue this in principle although it will affect the weight to be ascribed to any epidemiological derived figure.

139. The respondent takes issue with the appellant's criticism of reliance upon the Peto Report and the alleged uncertainty relating to the nature of any fibre type component.

Discussion

140. Six experts were instructed and gave evidence at the hearing before the judge (para 6 above). As the judge noted at [87], the test for causation remained the same as in other asbestos related claims but "the breadth of available and relevant evidence that must be considered in assessing whether the test is made out may well be considerably wider than in other comparable cases." It was the appellant, at the suggestion of their expert Dr Twort, a chest physician, who first sought permission to instruct an epidemiologist following which Professor Norrie was instructed. The evidence of epidemiology was considered by the judge in respect of the issue as to how the figure for Mrs Johnstone's occupational exposure to asbestos was to be assessed in terms of the test of material increase in risk.

141. The respondents instructed Professor Jones, described by the judge as having excellent credentials within his field but who is not an epidemiologist and did not claim to be one. The judge noted that he was well versed in the practical application of many of the crucial studies relied on in this case.

142. At [109] – [113] the judge addressed the issue of the material increase in risk as follows:

> "109. Leaving to one side their stated opinions about H&D, I consider the evidence of Professors Norrie and Jones to be, in many ways, complementary. Professor Norrie provides the epidemiologist's overview from an entirely 'clinical' or academic assessment, whilst Professor Jones provides practical application, borne of many years' experience. Professor Norrie's evidence that the exposure metric of f/m-y could have one meaning when applied to occupational exposure and another when describing ambient exposure was surprising given his apparent familiarity with the studies referred to in his report. This was though his first foray into the world of asbestos-related disease and that misunderstanding alone does not automatically undermine the value of the remainder of his evidence. Professor Jones, on the other hand, was able to draw on extensive, relevant experience, applied to the factual matrix in this case and producing worked models in tables to illustrate his opinion.
>
> 110. I accept the thrust of Professor Norrie's evidence which I interpret to be the exercise of significant caution when seeking to extrapolate down to low doses from H&D's model equation. His generalised reference to any useless model being as good as 'tossing a coin' seemed

> to me to be an attempt to put into layman's terms the potential outcome if that significant caution were not exercised. In any event, Professor Jones did indeed, in my judgment, pay proper heed to the need for caution in addressing H&D. In his report and in his oral evidence he gave persuasive evidence about the formulations within his report and the range of calculations. As already indicated, there is an inadequacy of evidence to reach absolute figures in this case and the Court is dealing with likely ranges and orders of magnitude.
>
> 111. Where I do part company with Professor Norrie is the suggestion in his report, when considering P&R [Peto Report], that as EJ [Mrs Johnstone] contracted MMP and she had had occupational exposure at D that she would be more likely to be in that one third of the cohort of cases in women (recognised occupational exposure). That was a rather simplistic approach, borne I expect of unfamiliarity with this area of industrial disease, bar the role he undertook in this case. On the other hand, Professor Jones in his evidence demonstrated fairly compellingly why the level of EJ's exposure was such that she would more likely be within one or other of the remaining groups (either ambient/unrecognised occupational exposure or idiopathic). His observations must now be seen in the context of my findings that Mr Stear's calculations are to be preferred. This leads to 0.1% or less increase in risk of developing mesothelioma.
>
> 112. I found Professor Jones' insightful observations and opinions on the issues of lifetime risk, his worked models and his conclusions highly persuasive. Added to this was the evidence of Dr Moore-Gillon. The Court does not reach conclusions in any case purely on the grounds of an expert's qualifications and/or experience, but Dr Moore-Gillon's extensive, recent involvement in mesothelioma research is a matter of which the Court can properly take note in assessing the medical opinion that he expressed. Moreover, having concluded that reliance should be placed on Mr Stear's estimates, there was no material divergence of opinion between the two medical experts.
>
> 113. Having considered carefully all of the expert evidence, I return to the observation I made much earlier that the fact that a person suffers some level of asbestos exposure and subsequently develops MMP does not without careful analysis of the individual circumstances establish a material increase in risk. I have reached the overall conclusion that any increase in risk in relation to EJ is in the order of 0.1% or less and that such a small increase does not satisfy the test of materiality."

143. The risk associated with the overuse of epidemiological evidence was highlighted in *Sienkiewicz* (the blue taxi, red taxi conundrum). Where the court is having to consider the issue of risk which necessarily involves statistics, epidemiological research and studies provide information. Uncertainty within such studies does not devalue the principle but it can affect the weight to be ascribed to any epidemiological derived figure.

144. The assessment of the material increase in risk in this case was not simply a matter of statistics. As is clear from the judgment, it encompassed evidence of occupational hygiene and evidence of a technical, epidemiological and medical nature. It included an assessment of the evidence of relevant experts and, as [109] – [112] demonstrate, Professor's Norrie's 'first foray into the world of asbestos-related disease' brought with it some misunderstanding and, on occasion, a simplistic approach when compared to the extensive practical experience of Professor Jones.

145. As to the appellant's contention that there is nothing in the Peto Report which directly personalises it to Mrs Johnstone, we disagree and accept the submissions of the respondent, that:

(1) The appellant did not challenge the methodology used in the Peto Report or the overall conclusion (which Professor Twort readily acknowledged);
(2) The Peto Report findings were relevant to Mrs Johnstone given the selection criteria for the case control study which included women born in the 1940's who had suffered mesothelioma;
(3) Reliance on the Peto Report research for determining the lifetime risk of mesothelioma for someone in this cohort was not contingent upon proof of what asbestos materials were in each school, house or office Mrs Johnstone spent time in.

146. The Peto Report was an observational study which has relevance to Mrs Johnstone. Firstly, she came within the selected cohort of mesothelioma patients ie. men and women born in the UK since 1925 and secondly, Table 1 provided an estimate of the lifetime risks of men and women born in the 1940s. At trial, the appellant relied upon figures (rural and urban) provided by the Department of Transport and Regions ('DETR') in his calculation of environmental exposure. The figures demonstrated a large range, at the rural level the exposure was estimated to be 0.00001 f/ml. At the urban level, it was 0.0001, ten times higher and in the vicinity of industrial sources of asbestos, it was estimated to be 0.001 f/ml, a hundred times higher. Further, only outdoor exposures were adopted by Professor Norrie and as Doctor Moore-Gillon observed, Professor Norrie "has not explained why, when calculating ambient background exposure, he has chosen to publish estimates for outdoor, concentrations of fibres, when we spend the majority of our lives indoors."

147. The judge correctly accepted that there were uncertainties in both approaches. We accept that the direct risk approach attempted to resolve the issue with an environmental statistic which was relevant to Mrs Johnstone's personal characteristic whereas the exposure/risk approach did not. Put shortly, there was a depth and relevant detail in the Peto Report which was not to be found in the DETR figures.

148. As to the appellant's arguments directed to the uncertainties of actual exposure to asbestos and its potency, of note is the joint statement of Professors Norrie and Jones in respect of Mrs Johnstone's employment at the garage between 1982 and 1989:

> "We agree that during this time she will have been exposed to some extent to chrysotile asbestos. We agree that exposure to chrysotile asbestos is an established risk factor for pleural mesothelioma. We also agree that chrysotile asbestos is less potent in its effect on increasing mesothelioma risk than amosite or crocidolite, other forms of asbestos

> that have been used in the UK. The ratio of relative effect at occupational exposure levels may be around 1:100:500 for chrysotile (white), amosite (brown) and crocidolite (blue) asbestos, respectively (Hodgson & Darnton, 2000)."

149. The joint statement set out the understanding of the parties which was essentially repeated by the judge in his judgment, namely the ratio of relative toxicity as between the different fibres. In the H & D study the modelling models the different toxicity as between the three types of asbestos.

150. Further, tremolite is a known contaminant of chrysotile. Recording matters that were not in dispute, or matters about which there was no evidence to the contrary, the Judge at [82(vii)] stated that:

> "The asbestos used in drum brake and clutch linings was chrysotile (albeit commercial chrysotile generally contained tremolite, an amphibole form of asbestos)"

151. The presence of tremolite is included in all the studies considered by H&D when they performed their epidemiological analysis. The exact mix is not known but what is known is that it is a mix. This was acknowledged by Professors Norrie and Jones in their joint statement as follows:

> "We agree that Mrs Johnstone will also have been exposed to asbestos from general sources in the environment, both out of doors and inside buildings. We agree that asbestos from environmental sources may include chrysotile, amosite and crocidolite although it is not possible to specify the relative proportions".

152. The question for the judge was "What was the measure of additional risk of contracting mesothelioma?" It was not, in our view, a misuse of statistics to take into account that chrysotile alone (albeit contaminated as noted above) was present at the garage, while leaving unresolved the uncertainty as to the forms of asbestos to which Mrs Johnstone could otherwise have been exposed. The latter was not capable of resolution, such that the risk that it included more toxic forms of asbestos was necessarily included.

153. The judge had the benefit of extensive evidence, written and oral, from experts, some particularly experienced in the field of asbestos related disease. His preference for the evidence of eg. Professor Jones to that of Professor Norrie is founded on fact and is fair. The judge was aware of the limitations of statistical and epidemiological evidence and proceeded with care and caution. His reasoning and findings do not support the appellant's submissions on ground 3 which we reject.

10. Ground 4: The Judge's Reasons

154. This ground is framed as a failure by the judge to adjudicate on a core issue namely why he preferred the direct assessment approach and rejected the exposure risk approach. In reality, it is a challenge to an absence of reasons. As is clear from the judgment, the judge did adjudicate upon the two approaches and he did so by preferring the evidence of Professor Jones as to the reliability of the direct risk assessment approach. The appellant relies upon the fact that Professor Jones was not advocating

for either approach and thus the judge, in being persuaded by Professor Jones's evidence, was not resolving the issue as to which approach should be adopted. The appellant also relies on the fact that Professor Norrie endorsed the exposure risk approach.

155. The judge accepted only the "thrust" of Professor Norrie's evidence which he clarified at [110] as meaning that H & D could be used but with significant caution. The judge recognised that Professor Jones did exercise such caution in his calculations. However, as previously stated, the judge preferred the evidence of Professor Jones as to the reliability of the direct risk assessment approach and gave reasons [109] – [112] as to why he did so. There is nothing in this ground of appeal which is dismissed.

11. The Respondent's Notice - The absolute risk approach (paras 77 – 81 above)

156. In advocating the absolute risk approach, the respondent relied upon the evidence of Doctor Moore-Gillon in its adoption of H & D's description of a life-time risk of contracting mesothelioma as being "insignificant" if it is less than 1 in 100,000. In his preliminary report, which acknowledged that the fact and extent of asbestos exposure is for the court to find, Doctor Moore-Gillon opined that any increase in risk of mesothelioma from Mrs Johnstone's employment with the respondent would be medically insignificant.

157. In our judgment, such an approach does not assist in proving the special rule of causation. Comparison of the tortious and non-tortious risk provides a basis for attribution as the impact of the tortious risk on the total risk can be considered and assessed. The absolute risk approach does not assist in attribution. Such an approach would make the word "increase" within the *Fairchild* exception otiose. It is the word "increase" which allows for liability to be determined.

158. Further, the absolute risk approach takes advantage of the difficulty of proving causation in industrial disease cases. If adopted, it would mean that even if there was a large material increase in risk of developing mesothelioma caused by a defendant, a claimant would not have a cause of action if their risk of developing disease was deemed medically insignificant. The tortious exposure could still have caused the disease; there is no scientific means of knowing. This flies in the face of the reasons for introducing the *Fairchild* exception which is to allow claims to be brought where causation could not be proved applying the usual rules.

159. To illustrate: a person could be exposed to a tortious dose that renders their lifetime risk of contracting mesothelioma as being medically insignificant, eg. 0.9 in 100,000. If their risk from environmental exposure was low, eg. 0.1 in 100,000, the tortious exposure would represent a nine-fold increase in risk which is clearly material. Adopting the absolute risk approach, the result would be that the employer would not be liable. Thus, the absolute risk approach would be detrimental to claimants who were exposed to small volumes of asbestos. As was stated by the appellant, current claims in this area tend to involve low doses.

160. As was noted by Lord Phillips in *Sienkiewicz*, materiality is a question for the judge. Adoption of the absolute risk approach would delegate this question to a medical expert. As the courts have long recognised, opinions amongst medical experts vary.

161. Finally, this court is not bound by *Bannister*. We note that the case, heard and determined in the High Court, was concluded in circumstances where no epidemiological expert evidence was before the judge. Such evidence was available in this case.

162. For the reasons given, we do not accept that the absolute risk approach is appropriate in cases where the court is required to assess the material increase in risk of a claimant contracting mesothelioma.

163. For the reasons that we have given, this appeal is dismissed.