Diseases with multiple known causes, occupational injuries, and medical assessment

Presented to Parliament
by the Secretary of State for Work and Pensions by Command of Her Majesty

June 2018

Cm 9632

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Diseases with multiple known causes, occupational injuries, and medical assessment

Dear Secretary of State

Diseases with multiple known causes, occupational injuries, and medical assessment

We present for your consideration the third in a series of Command Papers intended to clarify and simplify the decisions made in diagnosis and assessment of disability from occupational disease and injury. The first two[1] were concerned with decisions relating to assessing the causes of such diseases in claimants based on the best available scientific evidence. In this paper, we consider assessment of disability in claimants in whom both occupational and non-occupational risk factors are present and may be considered to have contributed to overall disability.

The reason for the work we report here is that those specialists charged with making decisions require clear, evidence-based guidance on the circumstances in which it is scientifically justifiable to deduct from the level of disability compensation in the presence of several possible causes. At present, partly owing to apparently conflicting decisions at appeals tribunals and partly to different individual practices by assessors from lack of clear guidance, there is evidence of differing practice across the UK. This can result in time and effort being wasted on appeals and inequity among claimants.

While the issues we discuss in our paper are complex, in essence our advice is simple and is based on scientific evidence. We recommend that it is justifiable to make a deduction from disability compensation where the evidence clearly shows that a disability is coincident to the prescribed disease or injury of claim, and wholly unrelated to it. However, on scientific and practical grounds, and in the interests of robust and equitable decision-

[1] *Presumption that a disease is due to the nature of employment: coverage and time rules*. Cm 8880, London, The Stationery Office, 2014
Presumption that a disease is due to the nature of employment: the role of rebuttal in claims assessment. Cm 9030, London, The Stationery Office, 2015

making, we advise against making deductions when there is considered to be a non-occupational risk factor that might in the future cause the prescribed disease or occupational injury but has not yet done so.

We believe that application of our advice will simplify assessment procedures, reduce the risk of appeals and, because the numbers involved are small, is unlikely to alter significantly the costs to the public purse.

Yours sincerely

Professor K Palmer
Chairman

Summary

1. Within the Industrial Injuries Disablement Benefit (IIDB) Scheme, there is a schedule of prescribed diseases associated with qualifying occupations. A successful claimant is assessed for the disability caused by that disease, or similarly in the event of occupational injury; compensation is awarded on a scale commensurate with the nature of the disability.
2. Awards are sometimes subject to deductions, reflecting the assessor's opinion that a part of the claimant's disablement is non-occupational in origin. The legal basis for this is set out *inter alia* in Regulation 11 of the Social Security (General Benefit) Regulations 1982.
3. While the Regulations allow for an increased award for interactions that cause worsening, this report is concerned with the circumstances in which they permit impairment from "other effective causes", such as pre-existing injury or disease, to be subtracted before setting the final level of award.
4. In secondary legislation "other effective cause" refers to a congenital defect, injury or disease, whereas the primary legislation requires assessment to be restricted to a claimant's "physical and mental condition" (as well as their age and sex). Judges of the Upper Tribunal (formerly called Commissioners) have held nuanced and differing views, however, about the place for *non-occupational risk factors,* including asymptomatic ones, within this framework and whether they can be considered as "other effective causes".
5. Risk factors can be regarded as attributes, either in individuals or their environments, that make one person more (or less) liable than another to develop a particular disease or injury. Obvious examples are genetic predisposition and exposure to airborne fumes, dusts, or chemicals in the workplace. Their effects may be strong, but usually they are weak, such that the future effects are rarely predictable with any certainty. Everyone harbours a multitude of risk factors and these tend to make mostly subtle contributions to future health.
6. Nevertheless, tribunal rulings have led to medical assessors having to predict (as a matter of medical fact) the future course of disablement from asymptomatic radiographic appearances or to assess a deduction from possible future deterioration if a claimant has had previous surgery on an organ or joint currently causing disability.
7. In this review we set out the legislative framework for "other effective causes" and

describe tribunal precedents and current practice within the Scheme. The underlying principles, the science that should apply, and the medical evidence base to support it are considered.

8. We consider two different circumstances in which disability occurs. In one of these, a disease such as a cancer or an accidental injury moves someone from apparent normality to disability, as an 'all or nothing' event (technically a 'stochastic' event). In terms of causation under the Scheme, if an occupational cause for such a stochastic event is accepted under the prescription, this implies that the cause of disability was proved on the balance of probabilities and the disability would not have occurred had the injury not been inflicted. In these circumstances there are clear scientific grounds for avoiding deductions for non-occupational risk factors.
9. In contrast, in other circumstances there is gradual development of functional impairment in an organ, such as the lung, or in a joint over time ('non-stochastic'). In these non-stochastic diseases, the tissue damage that leads to disability can arise from multiple occupational and non-occupational risk factors. We are concerned in this report with whether, and in what circumstances, deductions for non-occupational causes can be assessed reliably in such cases, based on the published scientific evidence.
10. We conclude that a deduction in non-stochastic diseases would only be scientifically justifiable if the extent of disablement from a non-occupational cause could be ascertained reliably at the commencement of the employment that has been assessed as responsible for the disability. This would imply the presence of objective evidence of prior disability from, for example, medical records of symptoms or abnormal measurements of function. Going beyond this is conjectural – there is substantial uncertainty in extrapolating. In practice, such objective evidence is rarely available. There are also practical reasons why it would be undesirable to apply such deductions selectively to only certain diseases but preferable to administer all prescribed diseases on a par with one another.
11. The Council therefore recommends that deductions are not made under Regulation 11(3) for non-occupational risk factors for prescribed diseases or injuries, when these factors have not manifested as ascertainable disablement prior to the start of the responsible employment. We recommend that this should apply across the Scheme as a whole.
12. Disability may also arise from coincident ill health that is wholly unrelated to the

relevant prescribed disease or injury, but which adds to the relevant functional loss. For example, a pre-existing genetic condition might impair lower limb function and happen to co-exist with occupationally prescribed knee osteoarthritis. Similarly, earlier disease such as tuberculosis or a phrenic nerve injury may impair lung function and coincide with occupational causes of lost lung function. A deduction would be reasonable scientifically in these circumstances and, while this is a matter ultimately for the courts, there is a good argument for defining "other effective" causes in this way if interpretation on this point (Regulation 11(2)) is not entirely clear in law. The aim should be to determine how much added disablement has occurred as a consequence of the claimant's employment relative to that which would exist if not for the employment.

13. It is the Council's understanding that deductions for "other effective causes" are relatively infrequent and typically small. However, their impact on individual claimants may be significant.
14. This report specifically does not include a recommendation for regulatory change. It is provided to support medical assessors charged with the difficult judgements that underpin disability assessment. However, it is published in the format of a Command Paper to ensure that decision-makers, policy officials, tribunals, Judges of the Upper Tribunal, the Department and other stakeholders have access to the Council's reasoning on the circumstances in which deductions for other effective causes under Regulation 11 are reasonable from the medical and scientific perspective and those in which they cannot be supported on scientific grounds.

This report contains some technical terms, the meanings of which are described in a concluding glossary.

Background

15. Employed earners can claim Industrial Injuries Disablement Benefit (IIDB) if they incur an occupational injury or develop a prescribed disease in the terms set out in Schedule 1 of the Social Security (Industrial Injuries) (Prescribed Diseases) Regulations 1985.
16. Assessment of their claim involves a review of their employment history, circumstances of exposure or injury, and a medical assessment of the diagnosis and of the functional impact of related impairments ('disablement').
17. The 1985 Regulations set out criteria by which claims for IIDB in employed earners must be tested. These include whether the claimant has the disease defined in Schedule 1 (sometimes called the 'diagnosis' question); whether he or she has had the occupational exposure in the schedule (the 'occupational' question); and whether the disease can be presumed to be "due to the nature of employment" (the 'causation' question). Alternatively, a claim can be tested against whether a personal injury has been sustained "out of and during the course of his employment" (Social Security Act, 1975, Section 50), in which case similar questions of diagnosis, entitlement and attribution to work have to be addressed.
18. A step that follows on when other matters are accepted is that of assessing the extent of disablement caused by the relevant injury or prescribed disease (called the 'disablement' question).
19. Previous Council reports have been concerned with the 'causation' question (Cm 880, Cm 9030; Position Paper 34). Key issues are repeated briefly here. This report focuses, however, on the 'disablement' question. Specifically, it considers claimants with occupational and non-occupational risk factors for the prescribed disease or injury, or who have a medical history complicated by conditions that are unrelated to the prescribed employment or exposure.
20. Scope is further limited to conditions that predate the industrial accident or prescribed disease (known to medical assessors as 'O(pre) conditions'), although those that develop after it (so-called 'O(post) conditions') also feature in medical assessment.
21. The law that governs medical assessment under these circumstances and current practices within the Scheme are reviewed. Some tribunal rulings are then described which raise questions about how assessment should work if claims are complicated by co-existing non-occupational risk factors or sources of disablement. The science

that should apply, the underlying principles, and their relation to tribunal precedents are considered and general advice is then offered to the Scheme's stakeholders.

Legal basis for assessing the extent of disablement

22. The legal basis for assessing disablement in claimants has been set out in several statutes and regulations – for example, the Social Security Act 1975, Section 57 and Schedule 8; the Social Security Contributions & Benefits Act 1992, Schedule 6; and the Social Security (General Benefit) Regulations 1982, Regulation 11 and Schedule 2.
23. Schedule 8 of the 1975 Act, which was later incorporated into the 1992 Act as Schedule 6, provides that extent of disablement should be assessed "by reference to the disabilities incurred by a claimant as a result of the relevant loss of faculty". Loss of faculty is a loss of function, power, or structure in an organ of the body; "relevant" means in relation to the injury or disease for which IIDB is being claimed or paid.
24. Schedule 6 further stipulates that the comparator for assessment should be "a person of the same age and sex whose physical and mental condition is normal" and that loss of earning power is not relevant to the assessment – i.e. that the basis lies in loss of function rather than any vocational impact. Furthermore, assessment must be made without reference to the circumstances of the claimant *other than* their "age, sex, and physical and mental condition".
25. The primary legislation enables regulations to be laid to define prescribed degrees of disablement for defined losses of faculty. And it allows account to be taken of disabilities arising from the relevant loss of faculty, but which also have another effective cause – e.g. pre-existing injuries and diseases sustained outside work.
26. This second provision, which is the subject of this report, has led to Regulation 11 of the Social Security (General Benefit) Regulations 1982, which stipulates how another "effective cause" of injury should be treated in medical assessment.
27. "Other effective causes" refers to impairments that are not caused by the scheduled employment but which contribute to the total loss of function and disablement. Regulation 11 provides that this part of the total must be *excluded* when determining the extent of disablement that is payable in benefit. (Technically, "other effective causes" can also be other occupational injuries, administered as a separate claim. A deduction for the first award may correspond to an addition for the second award,

simply to avoid double-counting: administrative changes of this sort are mentioned for completeness but, are not the substance of this report.)

28. A refinement is that, where interaction with another effective cause *worsens* the impact of a relevant occupational disability, the assessment can be *increased* to take account of the worsening. This report is concerned, however, with the circumstances which permit the contribution of impairment from "other effective causes", such as pre-existing injury or disease, to be subtracted from the total assessment before setting the final level of award.
29. Although Schedule 6 requires assessment only to be made with reference to a claimant's "age, sex, and physical and mental condition" and not other circumstances, tribunals have to interpret the law as indicating that *risk factors* for *future disease* are within the scope of physical or mental conditions that may be offset as other effective causes under Regulation 11(3). This issue is taken up below.

Risk factors

30. For the purposes of this report, risk factors can be thought of as attributes, either in individuals or their environments, that make one person more (or less) liable than another person to develop a particular disease or incur a given injury – they are *potential* causes of an event.[2] A more formal scientific definition is given in a concluding glossary. While risk factors may have a strong effect on disease or injury risk, most have only a weak effect, such that prediction of future effects becomes a matter of speculation. Everyone harbours a multitude of risk factors and mostly these make subtle contributions to future health. Often, in fact, they do not give rise to overt disease at all.[3] This issue is also taken up below.

How the law is currently applied in practice

The O(Pre) calculation

31. Medical assessors of IIDB who apply Regulation 11(3) are instructed to adopt what

[2] The term "risk factor", although extensively used in medical science, is not used in Regulation 11. Case law refers to a propensity or disposition to develop disablement and this carries an equivalent meaning.
[3] For example, while the risk of lung cancer is considerably greater in cigarette smokers than non-smokers, the great majority of smokers will not develop lung cancer over their lifetime.

is called an 'O(Pre) calculation'. In effect, the global or total disablement (G) is partitioned into the part that would have existed if not for the accident or disease (N), the element due to interaction (I) and the relevant attributable disablement (R), the formula in full being G = R + N + I. The net payable = G – N, or equivalently, = R + I.

32. In words, the compensable disablement represents the difference between the total and that part that would have existed anyway in the absence of occupational circumstances. The compensable element represents both the element due to the relevant injury or disease and any worsening of it caused by pre-existing disabilities that are otherwise unrelated to a person's claim. The part that may be deducted is that related to "other effective causes" under Regulation 11(3).
33. Regulation 11(3) can have a significant impact on the benefits that claimants receive, as "other effective causes" may reduce the percentage assessed disablement that is payable. At the lower end of the award scale, it is even possible that this may take the claimant below the threshold for payment of any benefit.
34. However, the Council has learned from the assessment provider that the case for deductions is made in respect only of occupational injuries and a restricted list of the prescribed diseases (PD) – those which are most likely to receive offsets comprising of: PD A4, PD A8, PD A12, PD A13, PD A14, PD B15, PD C30, PD D4, PD D5 and PD D7.
35. Of these, PD A14 (osteoarthritis (OA) of the knee) is likely to be numerically the most important, considering that some 35,020 new assessments for this condition were processed between September 2009 and December 2012 and 9,810 awards were in payment in March 2010.[4] By comparison, 4,710 awards for PD D7 and 2,460 for PD A8 were in payment in 2010.

Challenging cases and Commissioners' decisions

36. The Council conducted an audit that identified certain cases in which the effects of prior events, although apparently followed by full recovery, had been offset against prescribed diseases arising decades later.
37. Thus, for example, OA of the knee is compensable in coal miners working underground in certain defined occupations for 10 or more years in aggregate prior to 1986 (PD A14). However, in one case, a coal miner who had had surgery to the

[4] Counts are rounded to the nearest multiple of ten (Cm 8880, 2014, Table 1)

cartilage of his knee before becoming a miner, and who developed symptoms of knee OA almost four decades later, almost two decades after retiring from a qualifying period of work exposure, was deemed to have another effective cause for the mobility problems arising from his knee OA; a third of the assessed total disablement was deducted in consequence of the prior knee surgery. Cartilage injury and knee surgery are well recognised risk factors for knee OA and this factor was assessed to be another effective cause although the claimant had made a full recovery from his surgery, sufficient to work for many years in the physically demanding environment of an underground coal mine.

38. Other similar cases were found, such as a miner who had an episode of knee pain in his teens but recovered well enough to enter the coal mining industry and fulfil the qualifying period of employment underground.
39. *The Industrial Injuries Benefit Handbook 1 for Healthcare Professionals: The Principles of Assessment* ('the Handbook') provides advice to medical assessors that may have underlain other audited decisions. Deductions may be made for 'degenerative changes' on spinal X-rays in respect of awards for back pain injury. The Handbook refers to cases where "degenerative change, which was already present, would have caused problems eventually, whether or not the accident had occurred"; and which, worsening over time, could supplant the occupational injury in relevance to the point where "100% of the disablement [was] attributable to other causes".
40. These examples indicate that other effective causes are not treated as bounded by the requirement of being present at the time of assessment or onset of the prescribed disease or occupational injury: *risk factors* for disablement, even when not causing symptoms or functional limitation at the time, have been counted as other effective causes, looking forwards over the period of the award.
41. The Council has learned that such guidance to medical assessors reflects the decisions of Commissioners (since renamed Judges of the Upper Tribunal); but also that the decisions of Commissioners have not been wholly consistent or clear in their interpretation of Regulation 11(3).
42. There have been a number of case reports, for example, involving a constitutional liability to develop a disease which was symptomless before the relevant accident and for which no offset was deemed necessary. No deduction was made, for example, in respect of a pre-disposition to hysteria in R(I) 2/74), or a pre-disposition

to detachment of the retina in R(I) 3/76; and in R(I) 1/81, a Commissioner observed that "…constitutional liability to develop the disease cannot have been a 'disability' because it was wholly symptomless".

43. In CI/34/93, the Commissioner opined a more nuanced case: "The adjudicating authority must first assess the disabilities resulting from the relevant loss of faculty and any other effective causes and then should deduct ("offset") an assessment of the disability which the claimant would have suffered in the period of assessment if the relevant accident had never happened. *It is quite possible that a condition which was causing no symptoms at the date of the relevant accident could cause disability during the period of assessment*. Providing that the cause of that disability was a congenital defect or an injury or disease received or contracted before the relevant accident, and that the proper findings of fact are made, an offset equal to the extent of that disablement is required (*that disability does not need to exist at the date of the relevant accident*)" [emphasis added].
44. CI/34/93 referred further to the circumstance of a claimant sustaining a back injury, assessed for lifetime disablement, but "…where also *pre-existing arthritic changes in the spine, causing no symptoms at the date of the injury, would have caused symptoms by some date in the future*, even though the speed, progression and severity cannot be predicted precisely" [emphasis added]. It was argued that "In these cases, the adjudicating authority may make a uniform offset over the whole period of the life assessment, having taken an overall view of the whole period, and *it is not an obstacle that the claimant would not have been suffering any disability at the beginning of the period of assessment in the absence of the industrial accident*" [emphasis added].
45. The Commissioner went on to clarify a subtlety of meaning: "It cannot be emphasised too firmly that an offset cannot be justified merely by a finding that a claimant had some predisposition or liability to develop some disabling condition. There must be a finding that the claimant *would* have suffered a disability due to the other effective cause even if the industrial accident had never happened" [emphasis added]. In other words, mere predisposition to future disability is not enough; for a latent disease or predisposition to qualify as an 'other effective cause', it needs to be established as a medical fact that it *will actually* cause disablement. The Commissioner did not address the standard of proof concerning this determination, but by implication and based on previous practice it is likely to be on the balance of

probabilities.

46. This decision is more than two decades old, over which time the relevant medical evidence base and modern understanding of clinical epidemiology has grown substantially. However, inquiries from the Council have clarified that later judgements have not added to, challenged, or substantially amended the opinion. It remains influential in decision-making, as confirmed by comments from the assessment provider.
47. Of particular concern to the Council is the scientific challenge inherent in making the required determinations. In seeking to decide the appropriate deduction for a risk factor from a claimant's past medical history, judged at the point they are assessed and for the future period of award covered by assessment, a medical adviser or decision-maker would need to decide: (i) how likely it is that that factor has contributed to their current disablement to *any* degree, and if so, (ii) to what extent; and (iii) how likely it is that it will contribute to their *future* disablement to any degree, and if so, (iv) to what extent, all judgements being on the balance of probabilities. For example, in the claimant referred to in paragraph 37, how much did knee cartilage surgery, almost four decades previously, when followed by full recovery, contribute to their mobility problems at assessment (as compared with their diagnosed prescribed disease, knee OA, from long service as a coal miner)? And how much would it contribute, if at all, to mobility problems over the future period of their award relative to the effects of the prescribed disease? In a claimant "with pre-existing arthritic changes in the spine causing no symptoms at the date of the injury" (paragraph 44), similar questions arise. Whilst it is conceivable that a condition causing no symptoms at the date of injury might cause disability during the period of assessment (paragraph 43), the issue is how a deduction of, say, one-third can be arrived at scientifically and how medical advisors can make the necessary determinations robustly (particularly considering the general remarks made on risk factors in paragraph 30).
48. It should be noted that the reference comparator is a 'normal' person of the same age and sex as the claimant but not a person in perfect health. Since it is normal (commonplace) for older people to have symptomless osteoarthritis in their spine, for example, a question arises as to how much such a risk factor for disablement should be discounted as being an innate characteristic of the comparison group.
49. More fundamentally, a question arises as to how modern epidemiological and

medical reasoning about multi-causal disease should be factored into the assessment process.

Methods of inquiry

50. The Council decided to review the scientific principles that should apply in establishing offsets for other effective causes of disablement. Several experts in the field were consulted.
51. Consideration was also given to a related Council report, *Diseases with multiple known causes and rebuttal* Position Paper 34 (IIAC, 2015), which lays out epidemiological reasoning on multi-causal disease which bears upon the 'disablement' question.
52. For OA of the knee and low-back pain (LBP), two conditions featuring prominently in tribunal rulings, the review was informed by a literature search conducted by the Council's Research Working Group and an extra commentary has been developed, which appears in Appendix 1.
53. Emerging principles were tested iteratively with consultees. A list of those providing expert commentary is included in Appendix 2. The Council is particularly grateful to Professors David Coggon and Peter Croft for their thoughtful engagement with the review.

Stochastic versus non-stochastic diseases

54. At this point it is necessary to distinguish prescribed diseases which are 'stochastic' in nature from those which are 'non-stochastic'. Stochastic events have an 'all or none' quality, whereas non-stochastic ones involve functional loss across a continuum.
55. Cancer is an example of a stochastic disease. Characteristically, there is almost always a clear-cut distinction between people who have the disease and those who do not.
56. By contrast, chronic obstructive pulmonary disease (COPD) and sensorineural hearing loss are examples of non-stochastic diseases in which accumulation of injury to tissues results in a gradation of severity, the extent of loss being related to the causative dose, and with losses from other causes also potentially contributing to the total impact.
57. Because functional losses are incremental, the distinction between having and not

having a non-stochastic disease is necessarily arbitrary. However, by convention, to facilitate diagnosis and clinical management of diseases such as hypertension and COPD, doctors often define a threshold above which a treatable condition is considered to exist.

58. Case definitions for non-stochastic disease used in research often follow a similar convention. For example, in studies of OA of the hip, radiological measurements of joint space narrowing (which reflect a continuum of lost joint cartilage) are commonly classed in relation to a threshold agreed to define cases of disease.
59. For prescription purposes, some non-stochastic diseases (e.g. PD A10, PD D12) are defined in terms of functional loss above a stated level of severity. In exploring the 'causation' question, this allows the Council to marry current scientific understanding with the wording of the relevant primary legislation.
60. Although the distinction between stochastic and non-stochastic diseases can be circumvented for these purposes, it has potential consequences which are described below in relation to the 'disablement' question.

Non-occupational risk factors and stochastic disease or injury

61. Prescription seeks to define the circumstances in which occupational factors are causal on the balance of probabilities. Position Paper 34 provides advice on this and the 'causation' question in claimants who have both an occupational risk factor, 'X', defined by legislation, and a non-occupational risk factor, 'Y', for a given prescribed disease. Of note is that the disease can be caused *both* by 'X' *and* by 'Y' *in the same individual*. And *both* 'X' *and* 'Y' can be causal *on the balance of probabilities,* even if Y' is a more potent cause of the disease than 'X'.
62. This counter-intuitive circumstance arises because most diseases arise through several mechanisms, which (for a given disease) can vary between individuals, and sometimes require both risk factors to be present – absence of either would be enough for the disease not to happen. As explained in Position Paper 34, it is rarely possible to distinguish the causal mechanism(s) in a claimant who has the disease and several risk factors; all that can be said from epidemiological evidence is whether work was probably causal, on balance.
63. Thus, when attribution to work is possible on the balance of probabilities, the Council advises that disease should be deemed to be caused by work *irrespective of whether other identifiable causes may also have had a role*.

64. Consider now the medical assessment of a claimant with a stochastic prescribed disease who has a non-occupational risk factor for the same disease. Note that the essential question whether the assessed disablement is attributable to the scheduled work on the balance of probabilities.
65. If a stochastic disease is attributable to work on the balance of probabilities, irrespective of other identifiable causes, then all of the *disablement* arising from the disease is attributable to work on the balance of probabilities. This follows since the disease would not occur if not for the work exposure, and if the prescribed *disease* does not occur then any *disablement* arising from it cannot occur. It makes no sense scientifically to make a deduction for a non-occupational cause of the disease which is the subject of the claim.
66. Similarly, an occupational injury (accepted as such within the Scheme) is a stochastic event attributable to work; so its sequelae are attributable to work, including all the disablement arising from it.
67. Implicit in this account is that a stochastic event already present before the relevant employment would not be compensable, as the 'causation' question would not be supported.

Non-occupational risk factors and non-stochastic disease

68. For a non-stochastic disease the position is more complicated than for a stochastic one. The 'causation' question can be met if it can be shown that, but for the relevant occupational exposure, the disease would not have reached the level of severity specified in prescription. However, this does not preclude contributions from other causes, both to tissue damage and to the disablement associated with the disease.
69. In contrast to stochastic diseases and injuries, partial tissue damage and disability can arise from non-occupational risk factors for the disablement of interest when compensating the prescribed disease. For example, occupational and non-occupational sources of noise share in common a capacity to damage hair cells in the cochlea of the inner ear, thereby contributing incrementally to hearing loss which, if severe enough, constitutes deafness; cigarette smoking and coal dust can both contribute incrementally to damage and inflammation of lung airways and loss of lung function which, if severe enough, constitutes COPD; and knee-straining labours of underground coal mining and recreational knee injury can both contribute to losses of knee cartilage which, if severe enough, constitutes OA of the knee. Total

disablement can therefore arise from both occupational and non-occupational risk factors.

70. Disablement from the non-occupational cause may be manifest in the prescribed disease *before* commencement of work (pre-existing disablement) (e.g. deafness before work in a noisy job), or it may develop *concomitantly* with a scheduled occupational exposure (e.g. in a person exposed to noise both at work and at leisure over the same time period).

71. It would be reasonable in the case of a non-stochastic prescribed disease to make a deduction for established disablement from a non-occupational cause *at the commencement of the relevant employment* – to the extent that this can be reliably ascertained. This would imply the presence of objective evidence of prior disability from, for example, medical records of symptoms or abnormal measurements of function. Going beyond this is conjectural however, there being substantial uncertainty in extrapolating. In practice, such objective evidence is rarely available.[5] In theory a deduction could also be made for any disablement that occurs *during* the relevant employment and is due to concomitant exposure to a non-occupational risk factor. In other words, the disablement attributable to the disease might be apportioned between the occupational exposure and non-occupational risk factors.

72. However, this task is complicated because individuals differ, for genetic or other reasons, in their sensitivity to causes of disease. For example, the same exposure to noise may cause more loss of hearing in one individual than another; and the same exposure to coal dust (or cigarette smoke) may cause more loss of lung function in some people than in others.

73. A way of accounting for this, suggested by one expert we consulted, Professor Coggon, might be first to determine the disability that is attributable to the disease (as for a stochastic disorder) and then to make an offset based on the *expected average impact* of the non-occupational risk factors *relative* to occupational and non-occupational risk factors in combination.

74. We are grateful to Professor Coggon for the following illustration of the method:[6]

"*Suppose that a claimant with both occupational and recreational exposure to noise*

[5] Current assessment practices focus on the impact at the *onset of the prescribed disease or injury* – not unreasonably, as recall is believed to be more reliable than at the *onset of relevant employment* (often many decades previously).

[6] Note that no deduction is actually made for recreational exposure to noise in the Scheme's medical assessments. The example illustrates a general approach that might be taken, rather than current practice or a recommendation of the Council.

has sensorineural deafness that is judged to cause disablement of 30% (in comparison with a person who does not have the disease), and that on average his non-occupational exposure to noise would be expected to cause one third of the hearing loss that would result from the combination of his occupational and recreational exposure. In that circumstance, two thirds of the disablement from sensorineural deafness (i.e. disablement of 20%) would be ascribed to his occupation and one third to his recreational exposure."

75. However, the method requires scientific evidence on the average expected extent of disablement from non-occupational exposures. Professor Coggon commented that: "*In practice, few reliable data are available to underpin offsets of this sort. Thus decisions would be rather arbitrary, and potentially unfair to some claimants*."
76. It may be added that, while deductions are currently employed for some non-occupational risk factors for prescribed non-stochastic diseases (e.g. previous knee injury or knee surgery and knee OA; changes on a spinal X-ray and back pain), in many other situations they are not (e.g. smoking and COPD; leisure time exposure to noise and sensorineural deafness), or not consistently (e.g. obesity and knee OA). This inconsistency may arise in part because a risk factor such as smoking, although an important cause of lung injury, does not constitute a "physical condition" as defined in Schedule 6 of the primary legislation (paragraph 24); but for obesity, which is a well-known risk factor for OA of the knee, the reasoning is less apparent. Certainly, the differing applications of Regulation 11(3) are difficult to reconcile from a scientific perspective and a potential for inequity may exist, since offsets appear to be used only selectively and in a narrow range of circumstances. It seems that ambiguity about the underlying principles and legal constraints, and precedents of tribunals have gradually shaped practice, leading to a different treatment for claimants of some prescribed diseases and differing treatment of some risk factors.
77. While it would be theoretically possible to apply an approach such as that outlined in paragraphs 74 and 75, to do so uniformly and fairly would be very difficult, and would require substantial administrative effort and expertise, even if reliable underpinning data could be identified.
78. It may be recalled how, in CI/34/93, the Commissioner required certainty (at least on the balance of probabilities) about the future course of disability due to other effective causes, and not merely the finding of a predisposition to develop disability (paragraph 45). Want of data means that such certainty would, in most

circumstances, be impossible to deliver in practice: experts consulted by the Council all shared this view for the challenges highlighted in paragraph 47. An appendix offers further commentary on this issue for back injury and knee osteoarthritis, two of the principal conditions that are potentially subject to deductions for 'other effective causes' and highlights how arbitrary and conjectural extrapolation would be.

Disablement which is unrelated to the prescribed disease

79. The account above covers non-occupational risk factors for stochastic and non-stochastic diseases, and their associated disablement. Alternatively, however, disablement can arise in ways that are wholly unrelated to the effects of a prescribed disease or injury. For example, loss of lower limb mobility (difficulty walking or bending) could arise from OA knee, which is a prescribed disease in some circumstances (PD A14); but also for example from a coincidental congenital defect affecting another part of the lower limb. Similarly, loss of lung function could arise from COPD, which is a prescribed disease in some circumstances (PD C18, PD D12); but also from surgical resection of lung tissue infiltrated by a smoking-related malignancy – in this example the claimant would be breathless for two separate reasons, one work related and one not.
80. While in most circumstances deductions are not appropriate for non-occupational causes of a prescribed disease or occupational injury, it would be reasonable to make a deduction for disablement arising in a coincidental way. In assessing the extent of disablement that can be ascribed to the relevant employment or injury, the point of reference can be thought of as a theoretical person similar to the claimant in all respects except the relevant employment/injury and its consequences. In other words, the aim would be to determine how much added disablement had occurred as a consequence of the claimant's work. Disablement which is pre-existing and unrelated to the prescribed disease or injury can be regarded as an 'other effective cause' for which a deduction can legitimately be made.

Discussion and recommendations

Use of offsets for risk factors

81. For the reasons set out in paragraphs 61-67, the Council advises that, in the medical assessment of disablement from **stochastic prescribed diseases** and **occupational accidents**, it is not appropriate scientifically to make a deduction for

non-occupational risk factors that are other known causes of the disease or injury effect.

82. Even for **non-stochastic prescribed diseases**, where occupational and non-occupational causes (risk factors) of the disease can contribute to total disablement (paragraphs 68-69), the Council considers that deductions should only be applied for non-occupational risk factors that have demonstrably resulted in disablement *prior to the commencement of the relevant employment* (paragraphs 70-71). The Council stresses that want of robust evidence will normally render this approach impractical (paragraph 71). In principle a deduction might also be made for concomitant exposure to both non-occupational and occupational risk factors, and one possible way of deriving a suitable value, with some caveats, is outlined in paragraphs 74 and 75. However, paragraphs 30, 47, 73 and 77-79 identify important practical disadvantages in doing so: specifically, an approach that ensures scientific rigour and fairness would be very complex, require special expertise and effort to implement, and be limited most of the time by a want of the necessary data. The lack of capacity to make the required medical determinations with a high degree of certainty renders current practice necessarily more arbitrary and less robust than this standard, and therefore more open to appeal.
83. It may be added that the IIDB scheme, which is based on prescription rather than individual jurisdiction, is intended to be administratively simple, inexpensive to run, understandable to claimants, and geared towards producing equitable and consistent outcomes. The application of deductions that involve potentially unsound and practically complex matters of judgement threatens to undermine those principles.
84. A compelling case can be made, therefore, for not applying deductions for non-occupational risk factors of non-stochastic prescribed diseases, just as for non-occupational risk factors of stochastic prescribed diseases. This would be the Council's preferred position. It would have the considerable administrative (and legal) advantage that stochastic and non-stochastic prescribed diseases need not be distinguished and treated differently by medical assessors and decision-makers.
85. For the reasons set out in paragraphs 80 and 81, the Council advises that deductions for **other effective causes that are coincident and unrelated to the prescribed disease or injury** make scientific sense.
86. In fact, there may be a case for defining "other effective causes" with this restricted

meaning if interpretation on this point is not entirely clear and settled in law. Regulation 11(2) refers to offsets in relation to "any disabilities which, though resulting from the relevant loss of faculty, also result, or without the relevant accident might have been expected to result, from a cause other than the relevant accident"; while legal interpretation rests with the courts, if "other than the relevant accident [prescribed disease]", this might be read as implying 'other than risk factors *operating* through the prescribed disease or occupational injury', and thereby provide support for the Council's recommendation to avoid deductions for non-occupational risk factors for the prescribed disease or occupational injury.

Potential costs of not using deductive offsets

87. One impact of applying deductions for other effective causes is to reduce the levels of benefit currently paid to claimants. Statistics on the matter are not kept routinely, but in a small audit by Council members in July 2013 such deductions had been made in about 1 in 3 claims, typically to the extent of about one-third of the global assessment.
88. The Council's audit over-represented claims expected to pose particular challenges in medical assessment. The Department therefore checked the application of Regulation 11(3) in medical assessments involving award of benefit across IIDB centres nationally over a single week in 2017. The Council was reassured to note that deductions were relatively infrequent and small on the average (far less so than in its own audit), although their impact on individual claimants was sometimes greater.
89. This suggests that overall costs to the public purse of not applying offsets would probably be small – particularly since *this policy would be restricted to non-occupational risk factors for prescribed disease or occupational injury*. The costs of additional payments to a minority of claimants might be defrayed against reduced administrative costs or fewer appeals, but to a degree which the Council has not been able to quantify. In any event, a case can be made for simplifying the O(pre) evaluation and the administrative burden of routine medical assessments in which it commonly features.

Conclusions

90. In summary, (1) there are scientific grounds for avoiding deductions for non-

occupational risk factors for stochastic prescribed diseases and injuries; (2) there are scientific and practical reasons why it would be undesirable to apply deductions for non-occupational risk factors for non-stochastic prescribed diseases in almost all circumstances.

91. The Council has considered whether such advice is compatible with case law established by tribunal decisions, such as CI/34/93, and believes that it is. It notes that judges have ultimately placed the burden of proof as to the established medical facts of each case in the hands of the appointed medical experts; also, that reasonable certainty is expected regarding those facts. Opportunity is taken here to alert medical assessors and decision-makers to the extreme difficulty of applying deductions for non-occupational risk factors of prescribed diseases and occupational injuries in a sound and robust way. Given the danger that opinion will supplant fact, the Council advises them against the practice.
92. This report does not include a recommendation for change to Regulation 11. However, it is published in the format of a Command Paper to highlight the Council's advice to policy officials, decision-makers, medical advisors, Judges of the Upper Tribunal, and other stakeholders on the circumstances in which deductions for 'other effective causes' are defensible in terms of the science and those in which they cannot be supported on scientific grounds.

Equality and diversity

93. The Industrial Injuries Advisory Council seeks to promote issues of equality and diversity as part of its values. It has resolved to avoid unjustified discrimination on equality grounds, including age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, gender and sexual orientation.
94. In the context of this review the Council notes that Regulation 11 permits a deduction to be made from awards of IIDB to reflect 'other effective causes' of disablement which are pre-existing sources of disability, and that this is consistent with the primary legislation and the policy intention to compensate only that part of a person's disablement which is occupational, not that which would exist anyway. It further notes the scope to *increase* a disabled person's level of award in the event that an interaction between their pre-existing disability and an occupationally acquired disease or injury worsens their functional capacity.

95. The report highlights the potential for claimants of some prescribed diseases, or with some risk factors, to be treated differently in terms of the application of Regulation 11. This difference is unlikely to relate to any of the characteristics protected in law; but in the Council's view the recommendations in this report are still relevant to equitable, consistent and fair treatment of the Scheme's claimants.

Glossary of terms

Terms defined by statute or in case law

The following terms have been defined in statutes (including in particular in section 122 of the Social Security Contributions and Benefits Act 1992):

"**Relevant accident**" means the accident in respect of which industrial injuries benefit is claimed or payable.

"**Relevant Injury**" means the injury in respect of which industrial disablement benefit is claimed or payable.

"**Relevant loss of faculty**" means in relation to industrial injuries benefit the loss of faculty resulting from the relevant injury.

"**Loss of physical faculty**" includes disfigurement whether or not accompanied by any loss of physical faculty.

In cases R(I) 3/76, R (I) 1/81, R(I) 4/94 and Jones v Secretary of State for Social Services, Hudson v Same [1972] AC 944 the following definitions were approved:

"**Injury**" means hurt to body or mind and includes all the adverse physical and mental consequences of an accident.

"**Disability**" means inability, total or partial, to perform a normal bodily or mental process, which persons of the same age and sex and normal physical and mental powers can do.

"**Disablement**" means a collection of disabilities, that is to say the sum total of all the relevant disabilities found present in a given case including those resulting from an industrial accident.

"**Loss of faculty**" means a cause of disability and is used in the medical sense of loss of power or function of an organ of the body or impairment of that function. It is not itself a disability, but is a cause, actual or potential, of one or more disabilities.

Other terms used in this report

Other effective cause: This is dealt with in, and is the focus of, the report. In effect, a cause other than the relevant accident that is likely to contribute to the extent of disablement, over and above that caused by the relevant loss of faculty.

There is no simple definition given in the legislation. However, Regulation 11(2) of the Social Security (General Benefit) Regulations 1982 states: "When the extent of disablement is being assessed for the purposes of section 57, any disabilities which, though resulting from the relevant loss of faculty, also result, or without the relevant accident might have been expected to result, from a cause other than the relevant accident (*hereafter in this regulation referred to as "the other effective cause*") shall only be taken into account subject to and in accordance with [various] provisions of this regulation." Regulation 11(3) indicates that other effective causes can include "a congenital defect" or "injury or disease received or contracted before the relevant accident"; Regulation 11(4) refers to a particular instance in which the other effective cause is "an injury or disease received or contracted *after* and not directly attributable to the relevant accident". [Emphasis added]

Risk factor: An attribute of an individual, or something in their environment, which alters (usually increases) the likelihood of them developing a given disease or injury or worsens its severity.[7] In other words, a potential cause of a given outcome.

This report distinguishes *occupational* risk factors (those that are present in the work environment or are associated with work activity) from *non-occupational* ones (those that are unrelated to work).

Stochastic disease: A disease with an 'all or none' quality – a person either has it or they do not. (Accidents, similarly, are stochastic events, although their nature may be minor or major). 'Stochastic' diseases tend to arise with a probability that is dose-dependent, but their severity does not necessarily depend upon dose. Lung cancer is an example of a stochastic disease. The chance of developing it can be related to how much a person

[7] Factors that are *associated* with underlying causes, but not actually causal or not clearly so (e.g. age and sex), may also be described as risk factors in scientific reports. This account, however, focuses on factors that may *cause* diseases or injuries that fall within the scope of the Scheme.

smokes, but once developed its severity is not so related: while cancer can differ in severity from one person to another, the factors that determine this are generally different from those that determine whether it occurs or not.

Non-stochastic disease: A disease with a 'how much' quality and no clear-cut dividing line between diseased and not diseased; its functional effects can occur across a continuum, with accumulation of injury to tissues resulting in a gradation of severity from minor to major. Chronic Obstructive Pulmonary Disease and sensorineural hearing loss are examples of non-stochastic diseases. Both the probability of fulfilling case definition criteria and the severity can be related to the dose of the causative agent(s).

Appendix 1: Medical assessment of claimants with back pain and knee osteoarthritis

Back pain

1. The tribunal ruling CI/34/93 referred to in paragraphs 43 to 45 of the main report concerned a claim for back injury, sustained during the course of employment. Occupational injury can be regarded as a stochastic event and, in the Council's view, assessed according to the recommendations described above.
2. In respect of back pain, however, the case raises several generic issues about diagnosis, the prognostic value of medical imaging and a suitable reference category. Since back complaints often feature in medical assessment, these matters may of interest to stakeholders, although not central to the main arguments of this report. Discussion of them is provided therefore in this appendix.
3. Implicit in the ruling is the assumption that pathological changes can be reliably diagnosed on an image (e.g. X-ray or magnetic resonance (MR) scan) of the back and can reliably predict future disablement. In practice, several problems negate the utility of these investigations.

Disagreements over diagnosis

4. Firstly, radiologists do not always agree about the presence or significance of particular findings on spinal imaging. Thus, for example, in one study (Coste *et al*, 1990), agreement between experts was assessed for lumbar X-rays of 115 patients with LBP, including a random sample of assessments in which the expert read the same films a second time 'blinded' to their own previous opinion. Significant variability was observed across a range of structural abnormalities deemed potentially relevant in benign low-back pain; agreement was often no better than expected by chance and only somewhat better if the same expert read the films again. In a second similar study (Deyo *et al*, 1985), of spinal X-rays from 100 patients with back pain, agreement between two board-certified radiologists over 16 categories of diagnostic abnormality was "slight" to "fair" in eight instances, "moderate" in two, and "substantial" in five; agreement over whether there was any abnormality or not was described as "moderate", with disagreement in 24% of patients. When three experts independently read MR images of the lumbar spine in 122 subjects from a general population sample (chosen independent of symptoms) (Raininko *et al*, 1995), assessment varied substantially between observers. It was

more consistent for repeat assessments by the same observer, although, for some lesions, an observer disagreed with himself or herself 13%-25% of the time. Another American report (Fu *et al*, 2014) involved a consecutive series of 75 patients having a lumbar spine MRI at a department of musculoskeletal radiology. Each MRI record was assessed for 10 degenerative findings using standardized criteria. Despite pre-agreed rules on interpretation, the department's orthopaedic surgeons and rheumatologists displayed only "fair" to "moderate" agreement across nine of the 10 diagnoses. In a prospective multicentre controlled study (Anderson *et al*, 2012), 100 consecutive patients underwent MR imaging examinations of the neck within 48 hours of a road traffic accident. Findings in these patients were compared in a blinded fashion with those in 100 age- and sex-matched healthy control subjects by four blinded independent readers. Agreement between them was generally "poor". In a further revealing study (Herzog *et al*, 2017), the MR images from one patient, a 63 year-old woman with back pain and sciatica, were read independently at 10 different MRI centres. The overall level of agreement was "poor", such that among the abnormalities reported, one-third were identified by only one of the 10 centres; as judged by two other experts (representing the 'gold' standard or 'truth'), interpretive errors were common, and agreement was no better than expected by guessing at random.

Poor relationship to symptoms; poor predictive capacity

5. A second significant problem is that spinal imaging abnormalities are common even in the absence of symptoms. In one systematic review (Brinjikji *et al*, 2015), 33 studies were identified on this issue, involving computerised tomography findings on over 3,000 asymptomatic individuals. The prevalence of disc degeneration in people without back pain increased from 37% at 20 years to 96% at 80 years, while the figures for disc bulge were 30% and 84% respectively, for disc protrusion they were 29% and 43%, and for annular fissure they increased from 19% to 29%. In another systematic review (Endean *et al*, 2011), reporting on 19 studies, the median prevalence of MRI-diagnosed disc herniation in people without symptoms was 18% (interquartile range 10% to 25.5%); for disc protrusion, the pooled prevalence in the four largest studies was 27%. The authors concluded that "imaging findings [of spinal degeneration] are present in high proportions of asymptomatic individuals, increasing with age" and that "many imaging-based degenerative features are [a] likely part of

normal aging and unassociated with pain". Somewhat similar results have been found using plain X-rays. A systematic review by Van Tulder and Roland (1997) reported radiological abnormalities of degeneration and spondylosis in 40%-50% of people without LBP. In a much-cited research study from the 1950s, a random sample of the general populations of Leigh, Wensleydale, Watford and the Rhondda valley underwent radiological investigations (Lawrence, 1969). Lumbar disc degeneration was found in 65% of men and 52% of women aged >35 years, although changes were mostly mild; at the neck, 42% of men and 37% of women were said to have "definite disc degeneration", half of which was mild. The prevalence of changes rose with age in both sexes. By age 65, about 1 in 3 men had severe changes in the lower spine and 2 in 3 at the neck, implying that such imaging features are a normal accompaniment of ageing. In the study by Anderson *et al* of road traffic injuries (above), 10 findings thought to be specific for whiplash trauma were more found more often in patients than in matched healthy controls, but they were commonplace even in the non-injury group.

6. A related major difficulty in applying imaging findings to the assessment of disability is that (against common perceptions) only a weak relationship exists between imaging abnormalities and regional pain. Lawrence (1969) found an association only when disc degeneration was severe. Others cite evidence that "abnormalities in x-ray and MR imaging and the occurrence of non-specific LBP seem not to be strongly associated" (Koes *et al*, 2006). Van Tulder *et al* (1997) went as far as to conclude that "there is no firm evidence for the presence or absence of a causal relationship between radiographic findings and nonspecific LBP". As an example from the evidence base, when Witt *et al* (1984) examined the lumbar X-rays of 238 patients with LBP and 66 without, no differences between the groups were found in terms of pathological findings such as disc degeneration and spondylosis, although changes in both groups rose with age. Endean *et al* (2011) found a relationship with back pain; but after factoring in the high frequency of symptoms and imaging abnormalities, their calculations indicated that attribution of symptoms to underlying pathology could not be supported on the balance of probabilities –in other words, while a particular finding and back pain often occurred together in an individual, the likelihood that they were causally connected was no greater than expected by chance. (When a condition is very common in the general population, attribution to a given exposure on the balance of probabilities becomes problematic or impossible.)

7. A key assumption of the tribunal was that asymptomatic findings on a spinal image could be used by a suitably qualified expert to predict the extent of disablement over a future time period. In fact, there is evidence that calls this assumption into question. In the trial described in paragraph 3 of this appendix, of patients suffering whiplash injury in road-traffic accidents, early MRI findings in the neck bore little relationship to neck pain, headache, neck disability and neck-related work incapacity 12 months later (Kongsted *et al*, 2008). In the same study, "degenerative changes", deemed to be pre-existing and unrelated to the neck trauma, were also not associated with prognosis. In a Japanese study of similar design (Ichihara *et al*, 2009), 133 patients with whiplash injury were scanned and followed up over a decade or more. Progression of degenerative change on MRI was recognized in the spines of 98.5% of them, but symptoms diminished in more than a half of cases and there were no statistically significant associations between MRI findings and alteration in clinical symptoms. In a 5-year follow-up evaluation of 41 asymptomatic individuals, the risk factors for the development of lumbar disc degeneration and its progression were investigated (Elfring *et al*, 2002). At baseline, subjects had an MRI scan, repeated to the same protocol and read independently by two radiologists. Four in 10 subjects showed a progression in disc degeneration, but changes were only weakly correlated with the development of neck back pain over the follow-up time. In a study of 21 patients identified clinically as having lumbar disc herniation and managed non-surgically, at 7-year follow-up, there was progression of intervertebral disc degeneration but a reduction in the degree of herniation; comparing patients with and without symptoms at follow-up, no factors were identified on the initial MRI images capable of distinguishing patients who were and were not destined to develop new lumbago or sciatica (Tetsuo *et al*, 2005). In a cohort study from the Netherlands (Boos *et al*, 2000), individuals with asymptomatic disc abnormalities on MRI were followed for an average of five years. Disc degeneration worsened in 41%, but disc herniation did not; medical consultations with future back pain and work incapacity were predicted, however, by psychological factors rather than appearance on imaging.

Changes in medical practice

8. Reliance on imaging to adjudge disability or the potential for disability from back pain would also be at variance with modern clinical practice, which, with the passage of

time and a growing evidence base, has placed increasingly less faith in the predictive power of images of the spine. It has been found, for example, that radiology has limited value in identifying serious pathology; controlled clinical trials have shown that obtaining X-rays has little impact on prognosis and patient care (Kendrick *et al*, 2001); and professional advice has converged on the need to use radiology sparingly (in only a few well-defined circumstances). Thus, the Joint guidelines from the American College of Physicians and American Pain Society recommend that "clinicians should not routinely obtain imaging or other diagnostic tests in patients with nonspecific low back pain" (Chou *et al*, 2007). The Faculty of Occupational Medicine, Royal College of Physicians recommends against pre-employment radiological screening, which was formerly used to exclude workers at supposed future risk of back injury but later recognised unfairly to misclassify a substantial fraction of job applicants (Rockey *et al*, 1979).

9. The term "degenerative change" [in a spinal image] has itself come under critical scrutiny. It has been noted (e.g. Robertson *et al*, 2011) that radiologists often intend the label to indicate usual accompaniments in the ageing spine, everyday features, rather than frank pathology, in contrast to courts and international compensation systems that have been readier to ascribe claimants' symptoms to their age as an alternative to their work activity.

Problems of benchmarking

10. As noted in the main body of the report, the Scheme seeks to assess occupationally-related disablement *relative* to a "normal" person of the same age and sex; but imaging 'abnormalities' are so frequent in the general population as to be considered normal in the sense that they are typical in people of the same age and sex who do not have the occupational history of interest. If a feature of the comparison group, then their value in claims adjudication is severely undermined.

Implications

11. It is clear from the foregoing evidence that the use of radiological or imaging appearances to predict, and thereby discount, future disablement from back pain is a practice that rests on shaky scientific foundations. Medically speaking, such determinations cannot be made reliably on the balance of probabilities most of the time.

12. Circumstances can be envisaged in which the practice would be justifiable on medical grounds – for example, the unfortunate claimant with a spinal malignancy unrelated to occupation – but these will be rare and exceptional.
13. Older decisions of Commissioners on the common generality of back and neck pain pre-date a considerably expanded body of medical evidence. At this date IIAC judges the new evidence of sufficient quality and quantity to necessitate a change in medical opinion. Specifically, the Council recommends that the predictive and diagnostic powers of spinal imaging investigations are, except in rare special situations, not of sufficient reliability to be depended upon in medical assessment. It is understood that the Department's medical policy advisors share this view; the remarks are added for the benefit of all stakeholders.

Knee osteoarthritis

14. The case of OA of the knee is more complex than for back pain. Many people with radiological evidence of OA in the knee have related symptoms (pain, restricted movement, etc.). As with LBP, however, some people with radiological OA may be asymptomatic (Hannan *et al*, 2000). The converse is also true, knee problems being common in the absence of arthritic change (Peat *et al*, 2001). The concordance between disablement and radiological abnormality is far from exact, but better for knee OA than for spinal OA; also, imaging abnormalities are more predictive of future disability at the knee than the back (e.g. Cooper *et al*, 2000), and there is good consensus over diagnosis of knee OA. Problems in assessment do not, therefore, revolve around diagnosis and the relevance of structural changes to the extent that they do for LBP.

Apportioning disablement

15. More difficult is the challenge posed by 'other effective causes', as knee OA is a non-stochastic disease. As explained in paragraph 69 of the main report, knee-straining labours of underground coal mining and recreational knee injury can both contribute to losses of knee cartilage and to total disablement. In principle, the disablement attributable to the disease might be apportioned between the occupational exposure and other causes, given suitable data.
16. It is known that the relative risk (RR) for knee OA in people with a past history of joint injury is considerably elevated, ranging from about 3.5 to 7.0 (Davis *et al*, 1989;

Gelber *et al*, 2000; Wilder *et al*, 2002; Toivanen *et al*, 2010), while sufficient work as an underground coal miner can also give rise to knee OA, estimates of RR lying roughly in a range from 2.9 to 5.4 (see *Osteoarthritis of the Knee in Coal Miners*, Cm 7440).

17. A comparison of RRs for these occupational and non-occupational causes might suggest that some one-third to a half of the total disablement in a claimant with both risk factors is non-occupationally caused. However, assuming the method proposed in paragraphs 74 and 75 of the main report, the required comparison is not that of RRs for disease causation. Instead, estimation of the proportion to be deducted would require the *average disablement if having only the non-occupational cause* to be subtracted from the *average disablement if having both causes*. Thus, data are needed on the extent of disablement arising when OA knee is acquired under different scenarios, specifically: a suitable measure of functional loss in patients with *both* knee injury *and* a qualifying history of coal mining to set alongside a similar functional assessment in patients with knee injury in the absence of the work history.
18. While patients in the second group have often been investigated, the Council has not identified data on the former group which would permit the calculation. Most published data on occupation have looked at risks of developing OA knee (defined as a certain level of cartilage loss or radiographic changes) *de novo*; most reports on functional impairment have explored its association with medical factors (e.g. structural abnormality, mental ill-health, pain level) rather than occupational antecedents; and studies in coal miners have been few in number and incapable of addressing the question.
19. A further problem in applying the method of 'apportioning average disablements between causes' is that severity of knee OA is assessed on an ordinal rather a quantitative scale.
20. In summary, no data of the kind suggested in paragraphs 74 and 75 of the main report have been found to support the assessment of claimants with PD A14.

Assessing the future course of disablement

21. Medical assessors are also asked to predict the progression of the relevant disablement over the future period of the award. Strictly, if account is to be taken of the non-occupational risk factor, average trajectories of disablement need to be known in individuals with knee injury *and* the scheduled work history, as compared

with those with knee injury *alone*.

22. Some information exists for the second group (e.g. Cooper *et al*, 2000; Schouten *et al*, 1992) but not the first. Specifically, no data have been found on the progression of disablement in patients with knee OA and a previous history of underground coal mining with or without previous knee injury. Such data as do exist on progression of knee OA, in the generality of patients with prior knee injury, are limited to changes on an ordinal rather a quantitative scale. An expert consultee, Professor Coggon, commented: "…*few reliable data are available to underpin offsets of this sort*."
23. As stated in the main body of the report, the Council recommends against making deductions in these somewhat arbitrary circumstances.

Appendix 2: Experts consulted

The Council is grateful to the following experts for their comments on assessing disablement from 'other effective causes':

Professor David Coggon, Emeritus Professor of Occupational and Environmental Medicine, University of Southampton
Professor Peter Croft, Professor of Primary Care Epidemiology, Keele University
Professor Kim Burton, Director of the Spinal Research Unit, University of Huddersfield
Professor Gary Macfarlane, Clinical Chair in Epidemiology, University of Aberdeen
Dr Chris Walls, Occupational Medicine Specialist, Occupational Medicine Specialists Ltd, Auckland, New Zealand

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