

March 1999

The Moral Significance of Indetectable Effects

Sven Ove Hansson

Follow this and additional works at: <https://scholars.unh.edu/risk>



Part of the [Biostatistics Commons](#), [Logic and Foundations of Mathematics Commons](#), and the [Mathematics Commons](#)

Repository Citation

Sven Ove Hansson, *The Moral Significance of Indetectable Effects*, 10 RISK 101 (1999).

This Comment is brought to you for free and open access by the University of New Hampshire – Franklin Pierce School of Law at University of New Hampshire Scholars' Repository. It has been accepted for inclusion in RISK: Health, Safety & Environment (1990-2002) by an authorized editor of University of New Hampshire Scholars' Repository. For more information, please contact ellen.phillips@law.unh.edu.

The Moral Significance of Indetectable Effects

Sven Ove Hansson*

Introduction

In *Reasons and Persons*, Derek Parfit¹ identified five “mistakes in moral mathematics.” The fifth consists in believing that imperceptible effects are morally negligible:²

If some act has effects on other people that are imperceptible, this act cannot be morally wrong because it has these effects. An act cannot be wrong because of its effects on other people, if none of these people could ever notice any difference. Similarly, if some act would have imperceptible effects on other people, these effects cannot make this act what someone ought to do.

Parfit illustrated with collective actions in which effects of each individual action are imperceptible, whereas combined effects are clearly noticable and indeed highly significant morally: Each of his thousand-headed army of Harmless Torturers contributes only an imperceptible amount of pain to what they together inflict.³

Gruzalski⁴ renamed the Fifth Mistake the “Criticism of Individual Potency”, and Klosko⁵ focused on cases that “concern the production of effects that are imperceptible not only because they are not noticed, but because they must be performed in conjunction with large numbers of similar actions before harm becomes perceptible.” In response, Parfit embraced collective consequences:⁶ “Even if an act harms no one, it may be wrong because it is one of a set of acts that together harm other people.”

* Dr. Hansson is Associate Professor in Theoretical Philosophy at Uppsala University. He also holds a Ph.D. from Uppsala.

1 Chapter 3 (1987 [1984]).

2 *Id.* at 75; see also Jonathan Glover, “It Makes No Difference Whether Or Not I Do It,” 49 *Proc. Aristotelian Soc’y*, Supp.171 (1975).

3 *Id.* Cf. his *Comments*, 96 *Ethics* 832, 846-7 (1986).

4 Bart Gruzalski, *Parfit’s Impact on Utilitarianism*, 96 *Ethics* 760, 778 (1986).

5 George Klosko, *Parfit’s Moral Arithmetic and the Obligation to Obey the Law*, 20 *Canadian J. Philosophy* 191, 200 (1990).

6 *Comments*, *supra* note 4, at 847.

Most discussants have also addressed the imperceptible effects of sub-threshold pain inflictions. For example, Tännsjö argued that the Fifth Mistake is no mistake since pain intensity differences cannot be imperceptible.⁷

Kristin Shrader-Frechette has criticized Parfit for appealing to “atypical cases” such as the Harmless Torturers, rather than to “the typical cases of imperceptible effects”, including “painless, subthreshold exposures to dangerous chemicals.”⁸ She seems to be the first to see a close relationship to the health effects of low-dose exposure to radiation and chemicals, a major environmental policy issue.⁹

The more practically relevant category of examples that Shrader-Frechette introduces are somewhat different from Parfit’s original ones, and indeed the label “imperceptible effects” seems less adequate. Contrary to pain inflictions, low-dose environmental exposures are not matters of perception but rather detection or discovery. Therefore, the more general term “indetectable effects” is preferable to “imperceptible effects”. Further, Parfit’s “mistake” should be replaced by the less predisposed “problem”.

This essay addresses *the moral problem of indetectable effects of human behaviour*. It consists in determining if, and in that case how, it makes a moral difference whether or not effects of human behaviour are detectable. However, a couple of terminological clarifications should be made.

First, “detection” of a phenomenon means that its existence is ascertained through some empirical observation possible only when the phenomenon exists. A phenomenon may be indetectable, despite convincing theoretical reasons to believe that it exists. A nice example was proposed to me by an anonymous referee: If we add a small amount of hot water to a lake, the effect may be completely indetectable *ex post*. Any difference in temperature that we can measure is indistinguishable from random variations. But we know

⁷ Torbjörn Tännsjö, *The Morality of Collective Actions*, 39 *Philosophical Q.* 221 (1989).

⁸ Kristin Shrader-Frechette, *Parfit and Mistakes in Moral Mathematics*, 98 *Ethics* 50, 57-58 (1987).

⁹ *Id.*; see also Shrader-Frechette, *Parfit, Risk Assessment and Imperceptible Effects*, 2 *Pub. Affairs Q.* 75 (1988).

from elementary physics that our action has increased the temperature of the lake. This effect is knowable in spite of being indetectable.

Furthermore, the word “effects” in “indetectable effects of human behaviour” refers to the effects of specified human actions or activities. If a cancer develops in a person exposed to radiation from a technical device, but it cannot be detected that the disease is an effect of the exposure, then this disease is an indetectable effect of this exposure – even if the cancer as such can all too easily be detected. It would be more precise to speak of “phenomena whose property of being an effect of certain human behaviour is indetectable”, but the shorter phrase will be used for reasons of convenience.¹⁰

Although my examples refer to harmful effects, the problem applies equally to beneficial effects. Relevant examples can be found in preventive medicine. A campaign against smoking during pregnancy will, if successful, lead to reduced infant mortality, but it may not be possible to identify individual babies who survive due to the campaign.

Individual and Collective Detectability

Effects can be detectable either on the individual or only on the collective level. The following hypothetical example can be used to clarify the distinction. There are three substances A, B, and C, and 1000 persons exposed to each of them. Exposure to A gives rise to hepatic angiosarcoma among 0.5% of the exposed. Among unexposed individuals, the frequency of this disease is very close to 0. Therefore, the individual victims can be identified. This effect is detectable on the individual level.

Exposure to B causes a rise in the incidence of leukemia from 1.0 to 1.5%. Hence, the number of victims will be the same as for A, but although we know that about 10 of the about 15 leukemia patients would also have contracted the disease in the absence of exposure to the substance, we cannot find out who these ten patients are. The victims cannot be identified. On the other hand, the increased incidence is clearly distinguishable from random variations (given the usual criteria for statistical significance). Therefore, the effect of substance B is detectable on the collective (statistical) but not on the individual level.

¹⁰ Parfit misses this distinction when dismissing, *supra* note 1, at 75-76, radiation cases since the effects are perceptible although the causes may be unknown.

Exposure to C leads to a rise in the incidence of lung cancer from 10.0 to 10.5%. Again, the number of additional cancer cases is the same as for the other two substances. Just as in the previous case, individual victims cannot be identified. In addition, since the difference between 10.0 and 10.5% is indistinguishable from random variations, the effects of this substance are undetectable even on the collective level.

We can therefore distinguish between effects that are completely undetectable, like the effects of substance C, and effects that are only individually undetectable, like those of substance B. It should be emphasized that this is quite another distinction than the one that Parfit makes between perceptible effects of a single individual action and perceptible effects of a set of such actions in combination. Whereas previous literature has focused on how “sub-threshold increments... combine to produce discriminable harm.”¹¹ the present essay discusses the more general case of undetectable effects of (individual or collective) actions that do not necessarily combine with the undetectable effects of other similar actions to produce detectable effects.

The Nil and Reduction Theses

A distinction can be drawn between strong and weak versions of Parfit’s so-called mistake. The strong completely disregards undetectable effects, assigning no weight to them in moral deliberations. The weaker assigns to undetectable effects a lower weight than that assigned to corresponding detectable effects. Hence, we can distinguish between a nil and a reduction thesis for each of the two types of undetectability:

Nil thesis for individually undetectable effects (NI): If an effect is individually undetectable, then it is morally negligible.

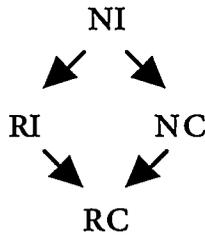
Nil thesis for completely undetectable effects (NC): If an effect is completely undetectable, then it is morally negligible.

Reduction thesis for individually undetectable effects (RI): If an effect is individually undetectable, then it has a lower moral weight than if it were individually detectable.

Reduction thesis for completely undetectable effects (RC): If an effect is completely undetectable, then it has a lower moral weight than if it were individually detectable.

¹¹ Glover, *supra* note 2, at 176.

Clearly, each nil thesis implies the corresponding reduction thesis. Furthermore, complete indetectability implies individual indetectability. We therefore have the following logical relationships between the four theses:



NI, the strongest of the four theses, requires full neglect of all effects that cannot be demonstrated on the individual level. This is essentially the standpoint referred to by Parfit as the Fifth Mistake.

Thesis RI, i.e. the assignment of reduced weight to individually indetectable effects, is well-known under another designation: the *discrimination of statistical victims*.¹² Our societies are willing to pay much higher sums of money to save known individuals in danger or distress than to reduce mortality or morbidity by measures not directed at identifiable individuals. Heart transplant candidates and trapped miners are examples of the former, whereas most measures undertaken in preventive medicine “only” save statistical lives, and receive much less funding per saved life.

Thesis NC, i.e. the standpoint that completely indetectable effects are no matter of concern, is a common implicit assumption in environmental policies. On occasions it is also explicitly stated. One example is a statement by Ernest Mastromatteo, who has served as Chairman of the American Conference of Governmental Industrial Hygienists (ACGIH), a private standard-setting body with a strong influence on occupational exposure limits throughout the world. Mastromatteo¹³ conceded that the Threshold Limit Values issued by the ACGIH “can never be used to guarantee absolute safety”, but found it sufficient that “they can be used to control adverse health

¹² Alfred Weale, *Statistical Lives and the Principle of Maximum Benefit*, 5 J. Med. Ethics 185 (1979); Leon E Trachtman, *Why Tolerate the Statistical Victim?* Hastings Center Rep., Feb 1985, at 14.

¹³ Ernest Mastromatteo, *On the Concept of Threshold*, 42 Am. Ind. Hygiene Assn. J. 763, 769 (1981).

effects of all types below the point at which they cannot be distinguished from their background occurrence". A similar statement can be found in one of the ACGIH's documentation volumes:¹⁴

A TLV-TWA [threshold limit value – time weighted average] exposure concentration of 5 ppm is recommended. It is the judgment of the TLV Committee that, if the average airborne exposure concentration to vinyl chloride does not exceed 5 ppm, there should be no detectable increase in the incidence of occupational cancers, specifically angiosarcoma of the liver.

More recently, the Health Physics Society wrote in a position statement:¹⁵

[E]stimate of risk should be limited to individuals receiving a dose of 5 rem in one year or a lifetime dose of 10 rem in addition to natural background. Below these doses, risk estimates should not be used; expressions of risk should only be qualitative emphasizing the inability to detect any increased health detriment (i.e., zero health effects is the most likely outcome).

However, the NC thesis is far from uncontroversial. In most countries, radiation protection is based on a presumed linear dose-effect model; the same applies to genotoxic carcinogens. According to the linear model, the expected number of excess cancer cases is approximately proportionate to the dose, and in particular it is not zero at above-zero doses.¹⁶ When the linear model is combined with the standard measure of risk, namely the statistically expected number (expectation value) of fatalities, the outcome is a regulatory practice that contradicts not only the NC but also the weaker RC thesis.

Moral Arguments

The following hypothetical can be used to clarify some implications of the four theses under consideration.

¹⁴ Documentation of the threshold limit values and biological exposure indices, 1698-1699 (6th Ed. 1991) Am. Conference of Governmental Industrial Hygienists.

¹⁵ Radiation Risk in Perspective, position statement of the Health Physics Soc'y, adopted Jan. 1996 <<http://www.inel.gov/resources/research/tschaech.html>> (visited Aug. 25, 1999).

¹⁶ Sven Ove Hansson, *Setting the Limit. Occupational Health Standards and the Limits of Science*, 115-119 (1998); see also Sven Ove Hansson, *The Detection Level*, 22 *Regul. Toxicol. & Pharmacol.* 103 (1995).

Three forms of lung cancer in the general population, are called I, II, and III. These variants have, respectively, frequencies of 9%, 1% and almost zero in the general population. Each has the same clinical symptoms, treatment, and prognosis. Differences, inconsequential for individual patients, can only be detected through laboratory tests.

Substance D, previously used by a large plastics manufacturer, gave rise to cancer variant III among 0.5% of exposed workers. This effect of the substance is clearly detectable on the individual level, and we can presume that it is considered to be unacceptable.

The company came up with a replacement, E. It also gives rise to lung cancer among 0.5% of the exposed, but the cancer is variant II. As a consequence, the effect is individually undetectable (but detectable collectively). According to thesis RI, the situation was improved through this replacement, and according to thesis NI the problem had vanished, and there was nothing to worry about.

However, due to public opposition to the NI thesis, the company continued research; after a while, it replaced E with new substance F. Like its predecessors, F gives rise to lung cancer among 0.5% of the exposed, but in this case, variant I. Therefore, the effect is not detectable even on the collective (statistical) level. According to thesis RC, the situation has improved, and according to thesis RI the problem is completely solved.

It's hard to believe that anybody would seriously claim that the replacement of D by E, or of E by F, was an improvement. The problem may be less conspicuous, but not less morally serious. The example can thus be used as a counterexample against all four theses.

However, examples can also be found in which the reduction theses have a certain plausibility:

In an acute situation there are two ways to repair a serious leakage in a nuclear reactor. One is to send in a single repairman, who will receive such a high radioactive dose that he is sure to die from cancer within ten years. The other option is to divide the dose between 100 persons. Each of them will have a 1% increase in the risk of dying from cancer during the coming ten years. Such an increase will not be statistically distinguishable from background variations.

The two options have the same expectation value, 1 excess death from cancer. Yet, it is fairly safe to surmise that almost all of us (including

risk managers and regulators) would prefer the second option to the first. If so, we may be said to endorse thesis RC.

A more general argument in favor of thesis RI (from which RC follows) can be based on the special duties owed to certain people. For instance, my duty to my children is greater than my duties to my neighbour's. Similarly, my duties towards the neighbour's children, with whom I am acquainted, are stronger than those towards strangers. A special weight emanates from such relationships.

This special weight is not necessarily zero for people towards whom I have no relationship other than as fellow human being. It seems natural to assume that it is still above zero for persons who have at least been identified. In other words, from my point of view, trapped miners stand in the same type of relationship to the statistical beneficiaries of preventive medicine as my kin and friends to the trapped miners.

In many cases, the morally relevant special relations between identified persons can be expressed as rights. Trapped miners may be said to have a right to our assistance, whereas statistical victims are not identifiable rights-holders and hence have no rights.

It must be emphasized that this is an argument for the RI thesis, but not for any of the two Nil theses. The personal relationships that may persist between identifiable persons give rise to increased moral concern and perhaps to additional moral obligations, but their absence does not create a moral vacuum.

In summary, the Nil theses (NI and NC) are implausible and can be at least provisionally rejected. This conclusion corroborates Parfit's choice of the term "mistake". With respect to the less extreme Reduction theses (RI and RC), the picture is less clear. Examples can be constructed that seem to support the two principles, but so can examples that point in the opposite direction. A reasonable argument in their favour can be based on the moral role of special personal relationships, but this is not a compelling argument. A reasonable moral theory may, but need not, support the two reduction theses.

