Not only scientists, but also responsible citizens

ABSTRACT — Scientific enquiry has provided important insights into the nature of health problems and inequalities in health, allowing us to see the pressing problems of individuals and their families from wider perspectives, including the social origins of health problems, the life histories of individuals and important relationships between population health and economic factors. However, science cannot be relied upon to solve these problems. In the last century, doctors advocated public health measures for the good of society that anticipated scientific explanations of how the measures would work. Similar advocacy is now needed to address problems of child poverty and social exclusion and their implications for society, the economy and public health in the next century.

The social causes of illness are just as important as the physical ones. The medical officer of health and the practitioners of a distressed area are the natural advocates of the people. They well know the factors that paralyse all their efforts. They are not only scientists but also responsible citizens, and if they did not raise their voices, who else should?

The title of this lecture comes from a quotation by Henry Sigerist, a German medical sociologist who became professor of medical history at Johns Hopkins. Writing in the USA in 1941, Sigerist was not describing the medical world he saw about him; nor would his comments be true now in any general sense. Sigerist was being provocative and the question he raised remains relevant and important: what are the limits of science that require us to be responsible citizens?

Medical practice in distressed areas

Julian Tudor Hart’s inverse care law states: ‘the availability of good medical care tends to vary inversely with the need for it in the population served’\(^7\). Despite the national general practitioner (GP) contract, general practice is not a level playing field – it is more like a swimming pool. Everyone who can be seen has their head above water, while practitioners in affluent areas are standing with their feet on the bottom, practitioners in deprived areas are treading water, and receiving deprivation payments for their trouble.

The reality of primary care in poor areas remains the high consultation rates, shorter consultation times and higher prevalence of major health and social problems competing for attention. Routine needs assessment surveys tend to underestimate this problem, missing the number, severity and complexity of health and social problems that exist within families. The needs of families in distressed areas are, however, all too apparent to practitioners working in the front line. They know that they are hard-worked and that their patients’ problems are deep-rooted. Yet the front line provides a limited perspective: it is also necessary to see two kinds of broader picture, relating observations made in clinical practice to society in general and to the life histories of individual patients.

The iceberg analogy

The first broad perspective comes from the late Geoffrey Rose:

> Alcoholics, drug addicts, rioters, vandals and criminals, the obese, the handicapped, the mentally ill, the poor, the homeless, the unemployed and the hungry, whether close at hand or in the Third World – all these are seen as problem groups, different and separate from the rest of their society.\(^8\)

Rose likened each problem to an iceberg whose visible tip can neither be understood nor properly controlled if it is thought to constitute the entire problem. The visible tip of the iceberg, or prevalence, is a function of its total mass, determined by the population average. Rose argued that a population strategy to sink the iceberg, rather than to attack its tip, is necessary whenever risk is widely diffused throughout the whole population. He concluded: ‘The primary determinants of disease are economic and social, and therefore, its remedies must be economic and social. Medicine and politics cannot and should not be kept apart’. A similar slogan – ‘Medicine is a social science and politics nothing but medicine on a large scale’ – was used by Rudolf Virchow 150 years ago to launch the first edition of his journal, Medical Reform.\(^4\)

Early origins of premature mortality

The second broad perspective comes from comparing mortality rates in Glasgow and Edinburgh\(^5\). Coronary mortality rates are over 50% higher in Glasgow than in Edinburgh; this is associated with a substantial difference in cigarette smoking, but not with large differences in any of the other main known risk factors. There are also differences in the consumption of fruit and vegetables. However, these data only give a close-up view of the problem of differences in coronary mortality between the cities.

Analysis of trends in all cause mortality rates in both
cities shows that the current differences in coronary mortality reflect a difference in mortality from all major causes of death, established early in life (by at least early adulthood) in successive generations. It is not that Glasgow has more heart disease, or cancer or strokes; rather, Glaswegians die earlier from all major causes of death. Cardiologists in Edinburgh are no less busy than their colleagues in Glasgow — cardiologists and cardiac surgeons across the country can all produce waiting lists to show how busy they are — but they are busy with patients at different ages.

The mortality data from Glasgow and Edinburgh are part of a national pattern of higher mortality rates in the north-west and lower rates in the south-east of the UK. Glasgow's position is remarkable, not just because its standardised mortality rate (SMR) of 179 for deaths under age 65 is so high, but also because these rates apply to such a large number of people. A focus on Glasgow should not detract attention, however, from the substantial differences in life expectancy that exist between and within other cities across the UK.

Most people have heard of the Whitehall study of civil servants, but few know that its methods were piloted in the west of Scotland, and copied for use in the Paisley and Renfrew (MIDSPAN) studies set up in the early 1970s. The latter included a prospective study of over 15,000 middle-aged men and women, comprising 80% of the general populations of Paisley and Renfrew. Since both the MIDSPAN and Whitehall studies collated their data using similar methods, it is possible to investigate which factors were associated with excess mortality in the west of Scotland in men aged 45–64 years. For example, lung cancer rates are higher in the west of Scotland than in the Whitehall study for a given exposure to cigarettes, but this is also true of manual compared with non-manual workers in both studies. Comparing manual workers in the two studies — a majority in MIDSPAN, a minority in Whitehall — reveals there is no difference in lung cancer rates for a given exposure to cigarettes. Such data suggest that excess mortality rates in the west of Scotland are not explained by 'Scottish factors', but by factors present in both populations but more common in the west of Scotland. MIDSPAN findings may be relevant, therefore, to similarly deprived areas in England and Wales.

The importance of FEV

All cause mortality rates are 55% higher in MIDSPAN than in the Whitehall study. However, 80% of the difference disappears when account is taken of the independent effects on all cause mortality of smoking, social class, height and forced expiratory volume (FEV), a measure of respiratory performance. The importance of smoking and social class is not surprising, but FEV is a relatively new risk marker. In MIDSPAN men, reduced FEV is second only to smoking in terms of population attributable risk for all cause mortality. In women it is the most important risk factor.

Comparing men and women in the top and bottom quintiles of FEV, respiratory impairment is associated with increased mortality from all major categories of death. The relationship is also true in life-long non-smokers, and when current morbidity is excluded by omitting cardiorespiratory deaths within five years.

FEV is a complex biological signal, partly determined in utero and during the first year of life, when we are endowed with a set of lungs with the potential for growth and development. Lung function increases with stature until adulthood when it reaches a peak and then gradually declines at a rate which may be accelerated by exposure to tobacco smoke and other environmental hazards.

In the MRC Medical Sociology Unit's 20–07 study, the youngest cohort already showed a social gradient in FEV at age 15 years. These findings not only show the biological origins of premature mortality, and the beginning of the process in a new generation, but also provide a basis for a general explanation of inequalities in health that would have been familiar to doctors 100 years ago.

General vulnerability to risk

Infection with tuberculosis requires not only exposure to the mycobacterium, but also a host whose susceptibility is compromised by constitutional, nutritional, environmental and economic factors, usually acting in combination. It would be hard to deny the importance of economic factors: 66% of Glasgow's postcode sectors fall into the worst deprivation categories, compared with 7% of postcode sectors in Edinburgh. In the UK there is a continuous gradient linking deciles of SMR with car ownership and child poverty. Using data from the USA, George Davey Smith and colleagues have shown a direct relationship between mortality and personal income, with the mortality differences between the top and the middle income levels as large as those between the middle and the bottom — precisely the type of continuous relationship on which Rose's iceberg model depends, and on which enlightened economic policy might be based.

In summary, broader perspectives on inequalities in adult health include iceberg effects, early origins, general vulnerability and the importance of economic factors. What is the relevance of these issues to children who will be adults for most of the next century?

The lead story

Britain's first municipal water supply opened in 1859 to bring clean water 30 miles by pipe from Loch Katrine to the city of Glasgow. It was an example of exceptional civic leadership. The idea had been suggested 25 years earlier but the commercial interests of water companies held the advance at bay. A professor from what is now Strathclyde University was also unpopular with the reformers by claiming that the water was 'so pure as to act on the lead pipes and poison our people'. Over a century would pass before the problem was recognised. Loch Katrine's soft water and
Glasgow's lead pipes provided an unfortunate combination. In 1977, 84% of households in the Loch Katrine water supply area were found to have lead levels above 50 µg/l in their tap water. At about this time, the European Union limit for lead in drinking water was reduced from 100 to 50, and more recently to 10 µg/l.

New research has shown that low levels of lead exposure that had previously been thought safe have an adverse effect on the intellectual development of young children. The effect, involving a decrement of two or three IQ points in relation to a 10 µg/dl increment in blood lead, is undetectable in individuals but, by shifting the population mean, is thought to influence the numbers of educationally gifted and challenged children in the population – another application of Rose's iceberg argument.

In 1993 over half of Glasgow's 300,000 households still had lead piping. However, the water company had instituted two programmes of water treatment, adding lime and then orthophosphate to raise pH and reduce plumbosolvency. What nobody knew was whether tap water lead still posed a hazard to public health. In an epidemiological study of tap water and blood lead levels in mothers of young children in Glasgow, we found that there had not only been a substantial fall in the prevalence of high tap water lead levels, but also decreases in the number of properties with very high lead levels, and in maternal blood lead levels for a given level of water lead. About one in eight infants was still exposed via bottle feeds to tap water with lead levels above the proposed EU limit; it is not known whether such exposure has adverse health effects.

The survey also showed that high water lead exposures were about twice as prevalent in affluent areas as in deprived areas because of the greater proportion of older, owner-occupied properties in affluent areas (Table 1). The proportion of children in affluent areas achieving three or more standard grade O-levels in their fourth year at secondary school and the proportion gaining three or more higher (taken in Scotland about a year before English A-levels) were also substantially higher in affluent areas. Most children taking standard grade examinations at school in 1993 were born in 1977 before any water treatment measures were introduced to reduce population lead exposure. As infants and toddlers, these children were exposed to about five times the proposed new legal limit for lead in drinking water. Whatever the hazards posed by such exposure, they are clearly small in relation to the educational advantages of children living in affluent areas. Children in deprived areas did badly at school despite their relative freedom from lead exposure. Dividing Glasgow's state secondary schools into top, middle and bottom thirds of exam performance, there is a clear association with child poverty, as indicated by the proportion of children receiving free school meals (Table 2).

### Born to fail

From a public health point of view, the tap water lead story has been a major success, but it is striking to compare the response to an environmental hazard affecting child development with the response to social hazards such as those highlighted at the same time in *Born to Fail*; a report that indicated the extent to which large numbers of children were being born and brought up to fail, first in the educational system and then in employment and the wider economy. In the 15 years following *Born to Fail*, the proportion of children born and brought up in households with below half the average national income tripled. It was as if the government had gone on a crash programme of installing lead plumbing in one-third of the households in the country.

### Child neglect in rich countries

Unicef's annual report for 1993 commented that in some industrialised countries the gains made during the 1970s were slowing or even reversing. The picture varied between countries with an Anglo-American culture (the USA, Canada, Britain, Australia and New Zealand) and those with a European continental culture (Germany, France and the Scandinavian and Benelux countries). During the 1980s, countries with an Anglo-American culture experienced falls in an index of the social health of children, while countries with a European continental culture experienced improvements. The reasons for this difference lay in differing responses to the slowing of economic growth during this decade. Unicef's accompanying volume, *Child neglect in rich nations*, laid the blame firmly at the door of the laissez-faire market-based policies introduced by Anglo-American coun-

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**Table 1. Housing type, water lead and school performance in Glasgow.**

| Neighbourhood type | Households with >10 µg/l (%) | S4 pupils with ≥3 standard grades (%) | S5 pupils with ≥3 higher grades (%) |
|---------------------|-----------------------------|---------------------------------------|------------------------------------|
| Affluent            | 24                          | 85                                    | 30                                 |
| Deprived            | 10                          | 49                                    | 2                                  |

S4 = 4th year of secondary schooling  
S5 = 5th year of secondary schooling  
Source: Final report of the Glasgow 1993 lead study. Copies available from the author on request.

**Table 2. School performance and poverty indicators in Glasgow.**

| League rating of Glasgow secondary schools | S4 pupils with ≥5 standard grades (%) | Pupils receiving free school meals (%) |
|-------------------------------------------|--------------------------------------|----------------------------------------|
| Top 11 schools                            | 26.4                                 | 23.7                                   |
| Middle 8 schools                          | 14.4                                 | 38.9                                   |
| Bottom 11 schools                         | 6.4                                  | 50.1                                   |

Source: The Scottish Office, 1997.
tries during this period. Martin McKee’s editorial in the *British Medical Journal* put it succinctly: markets fail children.

The consequences of neglect for children and young adults include adverse trends in reading skills, unmanageable and aggressive behaviour at school, drug misuse, unemployment, homelessness, crime and suicide. The problems present separately to a wide range of professionals – teachers, psychologists, social workers, psychiatrists, the police and GPs – and are all tips of icebergs that may be seen ‘as problem groups, different and separate from the rest of their society’. Rose’s argument that ‘the visible tip can be neither understood nor properly controlled if it is thought to constitute the entire problem’ means that we need to consider not only what the rest of these icebergs consist of, but also the possibility that they are all tips of the same iceberg, stemming from relative neglect and a lack of concern for the circumstances in which children are born and brought up. By analysing differences in mortality data, we see the long-term consequences of social and economic exclusion. By looking at child and adolescent health statistics, we see that the process of social exclusion is already well developed in the next generation.

**Economic and social indicators**

There is a consensus in official reports, from the Black Report onward, that the challenge facing health policy is to break the causal link that runs from deprivation to poor schooling, unemployment, low earnings and poor health. It is a tall order, but a more immediate task is to halt and reverse recent trends. Consider the inheritance of the current government.

The UK stands at the top of the European league table for the proportion of children living in households with below half average income (Table 3). Yet in 1996 average net incomes after tax were the highest in Europe – a paradox that has been achieved by having the most unequal distribution of income. Will Hutton, editor of *The Observer*, wrote:

> The top 10% enjoy an income equal to the whole of the bottom 50%... The top 10% can buy themselves such high quality private education and health care that they cease to have an interest in the education and health the state provides; they resent the taxes they have to pay for services they will not use. One of the underpinnings of the welfare state – that it is perceived as a structure for everyone – is thus eroded; it becomes a second best system from which the better-off escape. The boldness which allows them to argue that this escape is a moral obligation for them and the poor, helps legitimise their self-interest.

This voluntary social exclusion of affluent groups is a potent threat to the collective aspects of society.

In 1997 the UK spent less on education as a proportion of GDP than any other major European country (Table 3). In 1995 the average spend per head on welfare, covering such items as old age, sickness, unemployment and disability, was greater than in Portugal or Italy, but substantially less than in most other large industrial European countries. Despite current concern about welfare costs, the government actuary is reported as saying that Britain has no real problem of welfare costs by comparison with most other countries. Part of the explanation of our lower expenditure on public services is that tax and social security deductions from salary are lower than in most other countries. These figures have been collated from a variety of sources, and doubtless could be subject to refinement and further explanation, but even casual inspection shows that there is considerable scope for informed public debate about the kinds of economy and society in which we want to live.

In the USA, as part of Lyndon Johnson’s Great Society programme, the High/Scope Perry pre-school project randomly allocated children living in poverty to a high quality, active learning pre-school program, or a no-program group. At age 27, the group receiving the pre-school programme had higher average earnings, a higher percentage of home owners, a higher proportion completing school, a lower percentage receiving social services, fewer mental health problems and fewer arrests. A report from Barnardo’s concluded: ‘failure to provide children with adequate early support is not only ethically unacceptable, it is fiscally irresponsible’.

**Medical advocacy**

Above the entrance to the Inland Revenue Service in Washington there is a quotation from Oliver Wendell Holmes: ‘Taxes are the price we pay for a civilised society’.

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Table 3. Ranking of economic and social indicators in European countries.

| Country | Child poverty (%) | Net pay (£) | GDP per head spent on education (%) | Spend on head on welfare (£) | Tax and social security (%) |
|---------|------------------|------------|-----------------------------------|-----------------------------|---------------------------|
| UK      | 32               | 10,677     | 4.6                               | 3,000                       | 26                        |
| Ireland | 28               | 9,665      | 5.7                               | -                           | 28                        |
| Portugal| 27               | 5,286      |                                    | 1,500                       | 18                        |
| Spain   | 25               | 8,409      | 6.7                               | -                           | 20                        |
| Italy   | 24               | 9,618      |                                    | 2,800                       | 28                        |
| Netherlands | 16 | 10,204     | 4.9                               | 4,900                       | 30                        |
| Belgium | 15               | 10,267     | 5.5                               | 4,500                       | 41                        |
| Germany | 13               | 10,154     | 5.8                               | 5,600                       | 40                        |
| France  | 12               | 8,100      | 6.2                               | 4,800                       | 28                        |
| Denmark | 5                | 9,724      | 7.0                               | 6,900                       | 45                        |

Sources:

1. Percentage of children living in households with incomes below 50% of net mean average, Eurostat, 1993.
2. Average take home pay after tax and social security deductions, OECD, 1996.
3. Percentage gross domestic product spent on education, OECD, 1997.
4. Average private and state spending per head on old age, sickness, unemployment and disability, Eurostat, 1995.
5. Percentage combined deductions from salary for tax and social security, OECD, 1996.
He was a physician, best known for a scientific paper, 'The contagiousness of puerperal fever', first presented to the Boston Society for Medical Improvement. He was not only a scientist, but also a responsible citizen.

Rudolf Virchow has been called the father of modern medicine for his theory that most diseases have their origin at cellular level. When he visited Upper Silesia in 1848 to investigate the epidemic of typhus, his recommendations to prevent a recurrence were threefold: 'education, together with its daughters, freedom and welfare'. Virchow argued: 'If we get free and well-educated people, then we shall undoubtedly have healthy ones as well.' If Virchow were alive today, perhaps he would be arguing not only for education but also for the re-invigoration of local democracy. He was also a responsible citizen, in the sense of being responsible to ideals of citizenship.

Not only scientists...

Science is essential for progress, but if we rely on science to quantify every decision that has to be taken, science becomes a bar to progress. The call for more research can be a delaying tactic or a means to limit policy options to issues that can be researched. Science can also distract attention from big issues by focussing on the detail, the individual explanation or the specific hazard. In order to explain the tips of icebergs we need to focus, not on the specific agent, hazard or behaviour that leads to individual illness, but on the circumstances that influence susceptibility to these risks and determine from an early age whether life is likely to be short or long.

Gavin Milroy was an advocate of science, calling for the 'patient investigation of numerous, verified and authenticated facts in various localities and regions, and under different circumstances and conditions'. We call this 'geographical epidemiology', or the epidemiology of conditions by time, person and place. It is thought limiting because of the so-called 'ecological fallacy' whereby what is observed for a group may not be true for an individual. But what is true for the group does not have to be true for the individual, and is not disproved by not being true for some individuals.

Farr's law of population density – 'the closer people live together, the shorter their lives are' – encapsulated the effect of overcrowding on health. Farr did not know precisely how his statistical observation was biologically true, but this knowledge was not needed in order to develop and pursue policies to achieve the health benefits of clean water. Similarly, Oliver Wendell Holmes took his stand on the conditions causing puerperal sepsis 'on the existing evidence before the little army of microbes was marshalled up to support my position'.

Writing about clinical medicine, Feinstein stated: 'until the methods of science are made satisfactory for all the important distinctions of human phenomena, our best approach to many problems in therapy will be to rely on the judgements of thoughtful people who are familiar with the total realities of human ailments'. We need to apply the same good judgement to healthy public policy, to recognise that we have a major problem of child poverty, not of this government's making, but arguably its most pressing responsibility because of the implications for social cohesion, the economy and inequalities in health.

I suggest that our modern equivalent of Farr's data on overcrowding (which describe an important problem, do not provide a detailed explanation, but may be amenable to public health measures for social improvement) are measures of school performance, backed up by other measures of the circumstances and health of young children, not simply as an assessment of schools and teachers but as an aggregate measure of the outcome of the many factors inside and outside school that determine children's ability to prosper. The performance of schools is a public health issue, reflecting children's environments and providing an early indicator of social exclusion. The point needs to be made loudly. We should not only be scientists, but also responsible citizens.

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**NUTRITION IN CHILD HEALTH**

Edited by D P Davies

Nutrition is fundamental for a child's normal growth and development and it seems likely that nutrition, even as early as the fetal stage, may be a determinant of adult health. However, despite the great advances in knowledge, doctors as a whole tend to neglect this subject. This timely publication, based on a conference organised by the Royal College of Physicians and the British Paediatric Association, includes an overview of the current state of nutrition in children and adolescents and reflects the many aspects of paediatric nutrition.

This book provides a valuable source of information to paediatricians and other professional workers, including dieticians, involved in the care of children, and also to adult clinicians and medical scientists. It provides an up-to-date source of reference for both undergraduate and postgraduate educational and training programmes in childhood nutrition.

 Foreword by Dame June Lloyd

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