Weather, climate, and public health

F Ballester, P Michelozzi, C Iñiguez

Seasonal changes and the impact on public health

“Whoever would study medicine
ought must learn of the following
subjects. First he must consider the
effect of each of the seasons of the
year and the differences between
them. Secondly he must study the
warm and the cold winds, both
those which are common to every
country and those peculiar to a
particular locality...”

Hippocrates, “Airs, Waters, Places”,
400 bc

“As important as the overall
tendency toward global warming may
be to human health, the effects of the
extreme and anomalous weather
that accompany it be even more
profound”

Paul R Epstein, 2002

Many texts concerning epidemiology
and public health, especially those
on health matters related to environ-
mental factors, start by quoting words
written by Hippocrates more than
2000 years ago. As we see in the
quotation above, this wise Greek doctor
considered seasonal changes as funda-
mental factors in the explanation of
health phenomena occurrence. Twenty
centuries later this matter still
creates great interest not only among
researchers and health professionals,
but also among decision makers and
the general population. One of the main
reasons for this is the growing worry
concerning the potential impact on
health of an increase of ambient tem-
perature because of the process of
“global warming”.

The relation between environmental
temperature and health has been
known for a very long time. Various
diseases and disorders such as heat
stroke and hypothermia are directly
linked with temperature extremes.
Furthermore, the results of a number
of investigations suggest that the rela-
tion between mortality and ambient
temperature appears graphically as a
“U” or “V” shape, with mortality rates
lower on days in which the average
temperatures range between 15°C to 25°C,
rising progressively as the ambient
temperature becomes hotter or colder.

Investigations carried out in a large
number of cities have shown that the
temperature level corresponding to the
minimum mortality level varies from
place to place and country to country
according to the usual climate of each
zone and probably reflect adaptations of
the population to the usual range of
temperatures. The greater part of mor-
tality linked to heat occurs during the
first days after temperature increase,
while the effect of cold has been
described as being prolonged for several
weeks.

A fairly well studied phenomenon has
been the seasonal variation in mortality.
In fact, the periodic changes in weather
conditions are a fundamental factor in
determining the seasonal behaviour of
some forms of illness. Cardiovascular
and respiratory causes of death are
those most strongly linked to changes
in temperature; and elderly people and
those with impaired health or suffering
from poor social conditions are the most
susceptible to the impact of weather
changes. Typically, rates of mortality
increase each winter, referred to as
“excess winter mortality”. Initially this
phenomenon was related to influenza
outbreaks but has become a major
issue in Great Britain where estimates
show that around 40 000 extra winter
deaths occur every year. The results
of these studies suggest that exposure to
both heat and cold have an important
and direct effect on daily mortality
that, in the case of cold, can only
partially be explained by influenza
incidence.

Among the causes speculated to
explain the impact of cold are socio-
economic, mainly housing conditions.
However, results have been contradic-
tory up to now. In this issue of the
journal, Healy presents an interesting
paper examining variations in winter
excesses on mortality and some poten-
tial related factors in 14 European
countries. One of the major findings,
as was described in the Eurowinter
study is that countries with mild
climates (as southern ones) show higher
levels of excess winter deaths. Following
the results from the authors, socio-
economic conditions and housing stan-
dards could play an important part in
explaining these differences.

Previous articles do not find any
association with deprivation indices
although this could be attributable to
methodological problems such as the
ecological design that many of these
studies have, or the low sensitivity of
the indices used to discriminate social
conditions or housing standards. On the
other hand, there is greater evidence
that some housing conditions, especially
the presence of central heating and
insulating systems may play an impor-
tant part as far as protection is con-
cerned. A recent report has showed a
substantially greater winter excess mor-
tality in people living in colder homes in
England. This evidence has increased
the development of different pro-
grammes to improve heating systems
in homes having heating deficiencies in
the United Kingdom. Together with
housing standards, other authors have
highlighted the importance of clothes
and the type of activity that people
perform outdoors.

On the other hand, so called “heat
waves” have been linked with increases
in mortality, most notably due to cardio-
vascular and respiratory causes. The
effects of a heat wave are more notori-
ous at the start of summer, when
vulnerable people have not had enough
time to acclimatise themselves to the
high temperatures, and could be
explained, in a substantial part, as a
harvesting effect, that is to say: a
temporal displacement in the occur-
rence of death among frail people.
Home air conditioning has been described
as an important factor alleviating the
impact of high temperatures.

As well as temperature, the possible
interaction with mortality of other
meteorological phenomena such as
humidity or wind has also been men-
tioned. These factors are usually treated
as individual variables within the
model, but also variables or indices that
combine the most important element—
temperature—with other meteorological
variables are used (for example, dew
point, “apparent temperature” index).
Furthermore, a more holistic approach
(the so called: synoptic approach) con-
sidering city specific climatic categories
has been proposed.

Because most of the studies examin-
ing the impact of weather on health are
time series analyses, some methodo-
logical problems must be considered.
Besides their ecological nature, one
problem in these studies could arise
from the fact of differential population
being at risk in different months. That
is, it is possible that fewer residents are
in the city during the summer months.
This bias may be differential if the rate between the summer population and the winter population changes in the groups being compared (wards, cities, countries; ages, social classes). On the other hand, concern has been raised on the possibility that weather and air pollution are confounders. This criticism is crucial for the “weaker” predictor, air pollution. In this sense, a number of studies have proved the independent effect of air pollutants on health using different approaches for weather adjustment.\(^\text{14, 17}\)

Several public health actions have been proposed to prevent negative health effects of temperature such as educational programmes to produce behavioural changes in the population (clothing, to limit time spent outdoors, adequate drink/food), social measures (home insulation, adequate domestic heating/air conditioning), and sanitary measures (advice to prepare emergency services, hospitals, and general practitioners for an increase in demand for services).

In large metropolitan areas in the United States, health watch warning systems, based on a synoptic approach and on forecast meteorological variables to predict and to alert city’s residents of dangerous weather conditions during summer are applied,\(^\text{14}\) but have not been experimented with until now in European cities. These systems integrated with intervention activities (increasing emergency medical services, alerting groups of volunteers, guidelines for policy makers, and for specific subgroups of the population to avoid heat related illnesses) could be effective in reducing heat related mortality, and further studies to demonstrate the health benefits of these systems are needed.

The definition of public health programmes to prevent heat and cold related mortality needs further research to clarify: (1) the population at risk (elderly people, persons with cardiovascular and respiratory diseases, low social class groups, characteristics of the area of residence); (2) the lag time of the effect (few days, within one week, more than one week); (3) the effect on cardiovascular and respiratory morbidity (for example, analysing hospital admissions data); (4) the role of respiratory infections; (5) the significance of other meteorological variables (humidity, atmospheric pressure, wind, precipitation).

In conclusion, future epidemiological research that focuses on these specific questions will provide a more accurate measure of the full health impact and will assist in improving public health measures and mitigation actions to prevent heat and cold related health effects.

**REFERENCES**

7. The Eurowinter Group, Donaldson GC, Keatinge WR. Cold exposure and winter mortality from ischaemic heart disease, cerebrovascular disease, respiratory disease, and all causes in warm and cold regions of Europe. Lancet 1997;349:1341–6.

**Iraq**

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**Iraqi reconstruction: for an empowerment process**

**V Ridde**

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**Humanitarian assistance in Iraq after the conflict**

Between my missions in Iraq in 1994/95 and the latest in May 2003, the health of the Iraqi population has dramatically deteriorated\(^\text{1}\) and what little remained of the health-care system no longer exists. Total chaos reigns, healthcare centres have been looted,\(^\text{2}\) and patients are not receiving treatment. Twenty million dollars per month would be needed to revive the system.\(^\text{3}\) But for it to operate effectively, it is necessary to first reconstruct it. The purpose of this paper is to stimulate a debate on the possible effects of the current process of humanitarian assistance in Iraq, in which non-governmental organisations (NGOs) are involved, because it is necessary to meet the needs of the Iraqi people in an appropriate way.\(^\text{4}\)

For some time now, humanitarian actors have been alarmed at the confusion that results from military implementation of humanitarian projects. When American forces bombarded Afghanistan in 2001, with grenades accompanied by daily food rations and medicines, NGOs drew attention to this possible confusion.\(^\text{5}\) On the other hand,
the humanitarian agencies are not exempt from reproaches (for example, their links with the war\(^*\) or the harmful effects of their interventions\(^*\)). In Iraq, the English-American occupying power\(^*\) granted itself the right to run the country. Hence, they have taken on the major responsibility for providing security and covering the basics needs of the Iraqi population.

NGOs and United Nations agencies working in Iraq have to deal with these new actors today. The challenges of doing so are immense, because of the great confusion surrounding the role of the occupying power: “US-led reconstruction is starting out in something of a historical vacuum”. As a result, the armed forces have established the Office of Reconstruction and Humanitarian Assistance (ORHA). Yet NGOs know nothing about this organisation. After insisting for a long time, as of the end of May, the new coordination body of NGOs (NCCI) had still not managed to obtain an information meeting about the ORHA’s role and mandate. The occupying power maintains confusion by continuing to create a new authorities, bodies, and daily meetings. Some NGOs have decided to work in total collaboration with the US military. They are considered “embedded” by other NGOs. In our view, we feel that such collaboration undermines the independence of NGOs and their various codes of ethics.\(^*\) The meaning of accepting financing grants from the American government (USAID) is different when one collaborates with an occupying army, when the money is given to one by someone in combat uniform\(\dagger\) and when one acts as a contractor according to the modalities defined by the latter.

In our view, the current reconstruction process is not adequate. In a post-conflict situation, it is necessary to coordinate assistance\(^*\) but also to favour the appropriation of change and the empowerment of individuals, communities, and organisations.\(^*\) It is particularly true for Iraq where the regime in power has always controlled all structures and systems and forbidden any personal initiative. The problem of nursing is a good illustration of this inappropriate process. The healthcare system is still based primarily in hospitals. There is an insufficient number of nurses, the quality of care they provide is inferior, and this profession is depreciated. To tackle these problems, two American military (nurses) were mandated (ordre\(\dagger\)) to help the ministry to reorganise nursing care and training programmes. The interested NGOs are invited to participate. When military personnel arrive for meetings, they are adorned with their bullet proof jackets and M16s. They have downloaded training programmes on the internet and distributed them. After some days in Iraq, a member of an embedded NGO wrote to the ministry staff the Iraqi Plan for Nursing Development.

Not only is it necessary to be careful when promoting the training projects but especially important to act in a different way. At first, we believe that reflection concerning the reorientation of nursing has to be part of a more global discussion of the reform of the health system (that is, directed to primary health care). Then, it is necessary for NGOs to keep their critical role in the face of the reconstruction of a country by occupying forces and in the face of the importation of the Western biomedical model. Finally, the process of rehabilitation must be participatory and bottom up; considering capacities, values, and faiths of the population. To organise a consultative national forum of nursing is not enough, it is necessary that all actions reflect a will to empower professionals, population, and organisations more. It is necessary to plan reconstruction with the aim of social change\(^*\) and not simply for technical reasons. Individuals and organisations in Iraq have to become aware that they have a window of opportunity to decide on their fate. To be able to act so is certainly not the culture conveyed in military academies.

**REFERENCES**

Health care

Whose health is it anyway?: enabling participation

E Russell, C Smith

Public and patient participation in the healthcare decision making process.

Current policy rhetoric promises the public and patients wider participation in decisions about healthcare, and in the research that informs it, with an implication that participation is likely to generate substantial health benefits. However, it is not yet clear what can be done to make it happen effectively.

The British National Health Service (NHS) was built on an ethos of community spirit, solidarity, and sharing. Current media coverage suggests that this ethos has now been replaced by individualism and the blame culture for which Britain is now rightly infamous. As a result, the focus of participation seems to have become complaint rather than constructive debate. Compensation for adverse events that occurred when the risks were unknown has been described as a “moral right” (M Smith (Scottish Health Committee Chair), BBC Radio Scotland, Thursday 9 Jan 2002). Yet there is no logical or ethical leap from individual freedom to be healthy to a societal obligation to provide the services that might improve that health. A screening test that, by definition, does not provide certainty leads to accusations of negligence by the screeners when false negatives become known. The drive to report “medical error” and the National Patient Safety Association are two of the manifestations in 2001 that reflect the government’s moves to deal with the loss of trust and respect that has been so loudly expressed.

It should not be denied that mistakes and adverse events occur, but the current response to them fails to acknowledge that risk is a part of all aspects of life including science and medical care, and especially at the cutting edge of new techniques before they have been observed in practice. This sets a false basis for any discussion.

If the aim of greater involvement of patients in care and of the public in decision making is cooperation and shared decision making then an adversarial position is an inappropriate first step. There is a real possibility that such participation will simply be regarded as a right through which individual special interests can prevail, rather than as a path to mutual and common understanding of health issues and priorities.

A symposium in Aberdeen last year brought together some relevant perspectives to address the question, “Whose health is it anyway?” The main conclusion was that, until relationships between doctors and patients, between health systems and the public, between researchers and researched, become more honest and, crucially, respectful, there is not going to be much progress towards the 21st century paradigm of participation that is internationally espoused in recent legislation. So how can mutual respect be established? The starting point of the symposium was to try to understand what was undoubtedly a marked change in the relationship between medicine and its users during the 20th century. Kenneth Boyd, in a superb analysis of the doctor-patient relationship since the time of Hippocrates, noted that participation in health is hardly a new idea. Hippocrates said “It is not enough for the physician to do what is necessary, but the patients and the attendants must do their part as well and circumstances must be favourable.” This was said in the context of the need to establish a “therapeutic friendship between strangers”, a need that was the stimulus to develop medical ethics as we still know it. Boyd argues that this “therapeutic friendship” was severely challenged in the 18th and 19th centuries by the creation of a tacit contract between patients and hospital doctors to exchange taking part in experimental medical technology for the possibility of new benefits to their personal health. Anecdote suggests that this tacit contract, based on the hope of a win-win outcome, continued until the second half of the 20th century, when access to healthcare became an expectation and the success of medical science, in the media and the public mind, became a certainty not a hope. We forgot the end of the Hippocratic definition of medicine, which says: “knowing that everything is not possible to medicine.” In the view of the majority, who are healthy, medical care has become something that in the UK we have on tap, that we have a right to use when we need it, and that will make us better. Although sometimes when one became a patient (or close to a patient) the perception of absolute access and absolute certainty began to waver, it is only very recently that this perception is more widely expressed.

Trust in the NHS has had two very important effects for public health. Firstly, on prevention, if you believe that rescue is available and effective there is little need to invest in prevention, or to vote to ensure that there is enough rescue to go round. Secondly, the fact that in society as a whole solidarity is being eroded by individualism has led to a failure to recognise that giving everybody the same as each of us wants individually from the NHS adds up to a lot of resource. And again the professions have been no different from the public, as Alan Maynard was not slow to highlight at the Aberdeen symposium. Those who can use evidence based medicine have the strongest card in the pack for their particular funding need to be met without comparison with the needs of others. On all counts, there was unanimity that unless a more honest relationship between government, the NHS, public health, and the public is opened up soon then there is very little hope of achieving effective participation in health related decisions, whether individual or communal.

Easily said, but everyone recognised that this will be a long slow and sometimes difficult process. Nick Partridge, who chairs the Consumers in NHS Research group, showed with examples how participation can help both service and research to become more relevant and effective. The first task of that group was to recommend how consumer involvement could be enhanced at each stage of the research and development (R&D) process. The consumers said that they found it hard to get involved because they did not understand the structures. Slowly,
Policy implications

- Invitations to communities and public to participate in decision making about health care will be counterproductive unless they carry a commitment of time and effort to allow people to feel that they are active partners, and unless policies and plans are open to change as a result of their contribution.

Osteoarthritis

Shoes and lower limb osteoarthritis

E Pascual

Is there an association?

Osteoarthritis (OA) is among the most common types of joint disease and a frequent cause of pain and physical disability. It is the fourth most frequent predictor of health problems worldwide in women, and the eighth in men; in countries such as the United States, United Kingdom, or Canada its total economic costs have been estimated as 2% of the gross national income, second only to cardiovascular diseases. OA is now considered as a dynamic process in which what appears to be the consequences of the older idea of mechanical wear and tear of the joint coincides with remodelling developing countries to what extent such participation improves health and health care, but then that is also true in the developed world. This lack of evidence is not the same as absence of effect. Healthcare providers need to enable participation by patients and by communities as a matter of accountability to those for whom the service is provided, who in many countries also fund the service.

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REFERENCES


Key point

- Different mechanical factors weigh heavily in the development and progression of bearing weight joints in osteoarthritis, and also in the occurrence of symptoms in this condition, for which treatment is essentially asymptomatic. Chances are that specific shoes, by modifying these factors, are likely to result in symptom reduction and decrease in the need for medication. Research in this field to produce evidence seems to be worthwhile.
of joint structures, increased cartilage turnover, incomplete repair and new bone formation, more marked in the joint margins. \textsuperscript{4,5} Joints at the lower extremity, mainly knees and hips, are frequently affected in primary OA, resulting in various degrees of walking pain and difficulty. Although the causes of primary OA remain undefined, it is well established that mechanical factors play an important part in its development and progression. Obesity is an important risk factor for symptomatic knee OA, \textsuperscript{3} and both men and women with a body mass index of 30 to 35 have a fourfold increase of knee OA compared with normal weight controls. \textsuperscript{6} Prospective data on women suggest that the risk for known OA increases by about 15\% per each kg/m\(^2\) of body mass index above 27, and that reduction of a similar weight resulted in a similar decrease of incident knee OA, \textsuperscript{7} proving that this is a modifiable factor. At the knee, being overweight is also a risk factor for the development of OA at the patellofemoral compartment. \textsuperscript{8,9} Besides, longitudinal studies suggest that obese people with knee OA have a higher risk of experiencing disease progression than thinner people. \textsuperscript{10} The association between hip OA and overweight is not as strong as that of knee OA; in general the studies focusing on radiological hip OA have been inconsistent, while those reporting on symptomatic hip OA have in general found association. \textsuperscript{11} Weight can act on the bearing joints through the obvious mechanism of increasing the forces across the bearing joint, but also the bearing force carried by the knee and hip joints during walking is two to three times the body weight, \textsuperscript{12} and in the case of overweight the multiplied extra weight is a substantial added burden.

It seems that overcoming the mechanical tolerance of weight-bearing joints—probably by damaging some of their less tolerant structures—is an important risk factor for OA. It is not surprising that the risk of knee OA is doubled by having a job involving at least medium physical demands and knee bending compared with a sedentary job. \textsuperscript{13} Increased risk for OA of the knee in persons with activities that entail repeated knee bending or squatting have also been found by others. \textsuperscript{14,15} There is a link between knee injury and OA, \textsuperscript{16,17} also found at the hip joint. \textsuperscript{18} Other data support the importance that mechanical factors seem to have for the incidence and progression of OA, such as knee alignment, \textsuperscript{19} or having suffered an open meniscectomy. \textsuperscript{20} The relevance of mechanical factors in the development of knee OA justify the search of a possible relation between this condition and a long history of high heel shoes wearing, as carried out in the paper by Dawson et al printed in this issue of the journal, \textsuperscript{21} although such a relation was not found. Of interest, persons with lower bone mineral density osteoporosis have less OA in knees and hips than those with higher bone mass; \textsuperscript{22} this may be attributable to differences in mechanical stress through the bearing joints, and it has been suggested that more stiff subchondral bone with less deforming capacity under loading may lead to easier cartilage damage. \textsuperscript{23} OA affects preferentially to persons in the later stages of life and is a common cause of pain and infirmity for them. The reasons probably include factors other than accumulated work on the bearing joints such as the increased vertical impact of the feet by walking in this age group, \textsuperscript{24} declines in balance and lower extremity strength of older people with chronic knee pain, \textsuperscript{25} decreased muscular strength at the leg muscles, \textsuperscript{26} or a combination of all.

The goals in the management of OA are limited to symptom control to make the disease tolerable; it has to be kept in mind that for the patient the problem is not OA itself, but its symptoms. \textsuperscript{27} Surgical salvage procedures in some joints—such as the hip and knee—can be used when symptom control fails. The attempts to pharmacologically modify the disease progress have not produced substantial results so far. Analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) are widely used for this condition; because of the high prevalence of OA—and thus the size of the market—pharmaceutical companies have maintained efforts to develop new more effective or better tolerated drugs, and this has resulted in an important number of controlled studies and continuous attention to this essentially symptomatic therapeutic approach. The action of analgesics and NSAIDs on joint pain is quite independent of the mechanism of pain; one of the reasons for the success of these drugs in OA results from their efficacy relieving joint pain with independence of its cause. The origin of pain in the OA joint is poorly understood; a joint such as the knee may be affected by OA in different areas, and pain probably arises through different mechanisms—possibly related to the different ways in which a joint can be mechanically changed. In weight bearing joints, and particularly in the knee, symptomatic improvement also results from measures that decrease the load on the affected joint, such as weight reduction, \textsuperscript{24} or the simple use of canes, crutches, or walkers. Also patients generally note that pain increases with the use of the affected joint and may report that pain worsens if they carry weight, or when they gain it. Occasionally patients may report that comfortable shoes may reduce their symptoms. Shoes may help through different mechanisms, such as reducing the vertical impact of the feet, which is increased in older people, \textsuperscript{24} acting as shock absorbers—as some sports shoes do—, helping to improve the balance, which is reduced in older people with knee pain, \textsuperscript{29} or modifying the ways in which joints change. Wedged insoles have been found to reduce the load of the medial knee compartment \textsuperscript{30}—the most frequent location of OA in this joint—and, randomised controlled studies have resulted both in failure\textsuperscript{30} and confirmation\textsuperscript{31} of the symptomatic effect of this intervention. Shoes have received very little formal attention as therapeutic measures for symptomatic knee or hip OA. If one considers the relevance that mechanical factors have on the development and progression of OA and in the presence of symptoms in the affected joints, it seems worthwhile to evaluate whether shoes—by modifying mechanical factors—may result in lessening of the symptoms and perhaps disease progression. Indeed, ingenuity is needed to develop properly designed trials to produce evidence of the benefits of shoes if there is any. Also better understanding of the mechanisms of pain in OA of knee and hip appear necessary, as well as a possibility of grouping the patients according to the overcharged or overstressed structure or structures from which the pain may arise, in order to design the shoes accordingly. But in the end, if shoes prove useful in reducing the symptoms of some types of lower limb—or perhaps lower spinal—OA, and the use of drugs for this aim can be reduced, the benefit will doubtless be for all of us.

**Policy implications**

- It seems worthwhile to support research aimed at the development and testing of shoes designed to decrease the impact on the joints of the lower limb when walking or standing, or to correct specific alignment or mechanical alterations.
REFERENCES


2 Badley EM. The economic burden of musculoskeletal disorders in Canada is similar to that for cancer, and may be higher. J Rheumatol 1995;22:204–6.


