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These hormones act in tandem to control appetite. When the stomach is empty, it produces more ghrelin, which tells the brain that the body needs to eat. When the fat cells are full of fat, they produce leptin, which gives the message to the brain to eat less, and tells the skeletal muscle cells to burn off more energy. As ghrelin falls, leptin rises, and vice versa.

"We have some evidence that levels of ghrelin and leptin vary according to the duration of sleep, but these studies have been carried out in experimental conditions of extreme sleep deprivation in human volunteers, so we need a lot more data on normal populations before we can say these mechanisms can explain the relationship we have found between sleep deprivation and obesity," Franco said.

These studies will also make use of technology that will allow the researchers to measure the activity of the body in relation to sleeping and waking. A device similar in size to a wristwatch can record body position in three planes, and has an inbuilt light sensor. This device can also record an electrocardiogram, using a single electrode lead. The data recorded in this way provides information on whether sleep is fragmented, or of a good quality.

Impact of shift work

Ed and Franco are also setting up a research programme to investigate the impact of different patterns of shift work on doctors. Although junior doctors have traditionally worked very long hours, there is now increasing evidence that the sleep deprivation that they suffer has many adverse effects.

Franco said one study in the US, carried out at Harvard Medical School in Boston, has shown that doctors who spent extended periods of more than 24 hours on call were 3.6 times more likely than those whose on-call hours were limited to no more than 16 hours at a stretch to make serious medical errors, and that these errors were unlikely to be picked up. The same study showed that, when driving home after finishing their shift, those who had been on call for over 24 hours were three times more likely to be involved in a traffic accident than those who had been on call for no longer than 16 hours.

Shorter hours for doctors

The UK Residents' Work Hours and Sleep Research Programme established by Ed and Franco is timely: most doctors working in the NHS should currently be working no more than 56 hours a week in order to comply with the European Working Time Directive, but by 2009, the number of hours worked each week has to fall to 48 or less.

There are, of course, many different ways of achieving 56 hours of work a week, but different ones may be favoured by doctors, their managers and their families.

Franco said: "This provides us with a natural experiment. We can compare the effects of different rotas with a total of 56 hours a week now, with the effects of different rotas and only 48 hours of work a week in 2009. Our aim is to pick the best rota that benefits patients' safety, matches the natural circadian rhythm of the doctor's body, while at the same time meeting the demands of the employers who need to deliver effective and efficient services."

The researchers will study not only health and performance, but also the sociological aspects of the different rotas, in collaboration with Simon Williams, Reader in Sociology at the University of Warwick.

Christopher McCabe, Professor of Health Economics at Warwick Medical School, will help to assess the economic implications of the changes.

Other collaborators will include Harvard Medical School, the Royal Colleges and professional associations. Two local NHS trusts are willing to take part. The group is currently seeking funding for this study.

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Health at Warwick **update**

Sleep: a new sociological agenda

Sleep is something that all human beings do; it is woven into the fabric of our everyday lives. So why have sociologists overlooked its importance until recently?

The more that Simon Williams, Professor in Sociology at the University of Warwick, thought about this question, the more convinced he became that sleep is a very rich topic for social scientists to examine and research. He said: "The very structuring of our everyday lives revolves around two key temporal events, namely waking up in the morning and getting ready to go to bed at night. *How* we sleep, *when* we sleep, *where* we sleep, *who* we sleep with, and the meanings we accord sleep are all important social, cultural, and historically variable matters. Sleep is too rich and important a topic to leave solely or simply to sleep scientists and sleep medics to research, debate and discuss."



Simon Williams: 'Any sleep problems are thanks to the recent arrival of my twin boys'

Not everyone agreed with him. One colleague, told that he was delivering a paper on the sociology of sleep, assumed that it was a spoof. Others thought he must be interested in sleep because he had a sleep disorder; he doesn't (to the best of his knowledge). Still others assumed that it was really dreams or dreaming that had captured his imagination—given that sleep was a blank or non-event.

The reason Simon became interested in sleep, he said, is because it consumes such a huge chunk of our lives. The more he thought about it, the more odd it seemed that social scientists, especially sociologists, had not looked at it in detail. "This is particularly strange when you consider the public debates that go on, regularly rehearsed in the media, to do with whether or not people are getting 'enough' sleep—whatever that means—and whether people may be a danger or a risk as a result of sleep deprivation, for example," Simon added.

One of the first results of his new-found interest in sleep has been a book, *Sleep and Society*¹, which is aptly subtitled, "Sociological Ventures into the (Un)known". The book reviews the changing theories and explanations of sleep, from ancient to modern times, as well as historical patterns and practices associated with sleep. A further chapter describes people's experiences of falling asleep, including reactions to daytime sleeping. This chapter goes on to describe changes and views about sleep at different stages of people's lives.

'Sleep is a very rich topic for social scientists'

The chapter on "The social patterning and social organisation of sleep" provides a fascinating account of different habits relating to sleep throughout the world: from the Masai of East Africa who can sleep standing up, via the siesta-friendly Mediterranean cultures, to the "napping culture" prevalent in Japan.

Simon also discusses the medicalisation of sleep—the social construction of sleep problems and pathologies, the calls for society to take sleep more seriously, and the increasingly important roles of the media and the pharmaceutical industry in dictating people's views about sleep and its management.

'Sleep consumes such a huge chunk of our lives'

The media's treatment of sleep issues and sleep disorders has also proved a fruitful area for research. Simon, together with Clive Seale, Professor of Sociology at Brunel University, and with Sharon Boden and Deborah Steinberg, both of the University of Warwick, and Pam Lowe of Aston University, has been exploring the range and type of coverage of sleep stories in several UK newspapers. This project was funded by the British Academy, with Simon as the Principal Investigator.

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The researchers analysed coverage of sleep in 5 British newspapers—*The Times*, *The Guardian*, *The Sun*, *The Mirror* and *The Daily Mail*—which together accounted for more than three-quarters of the total circulation of UK national daily papers in 2005.

By carrying out a search for “sleep” in the headline or first paragraph of the article, they identified 1051 articles between 1985 and September 2005. Key areas of media coverage included the following:

- The expertisation / medicalisation of sleep;
- Sleep, risk and public health/safety;
- Sleep and work in 24/7 society;
- Sleep, gender and family life;
- Sleep, commercialisation and consumption in consumer culture;
- The “rights” and “wrongs” of sleep.

Simon commented: “We found that the media are clearly important players in raising sleep as a matter of public concern. While the media amplify certain concerns about sleep, however, this media coverage is far from uncritical in relation to sleep experts’ claims and pronouncements about our sleep (or lack of it), particularly in ‘serious’ papers such as *The*

Guardian or *The Times*. The media, as such, provide a differential platform not simply for the (de)medicalisation of sleep, but also for the construction of sleep as a matter of public concern. Media coverage of sleep matters, in short, is complex if not contradictory”.

‘The media are clearly important players in raising sleep as a matter of public concern’

Results from this media project are currently being written up. Two papers, one on the medicalisation of sleep⁴, and another on the social construction of sleep and work⁵, have been submitted. Another paper, comparing and contrasting the social construction of insomnia and snoring in the British news is currently in preparation⁶. Simon is also working on various special issues of journals in order to showcase papers from the ESRC seminar series on Sleep and Society.

Looking to the future of sleep research in the social sciences and humanities here at Warwick and beyond, Simon is optimistic. “Clearly this is an important and indeed fascinating new area of research which is likely to keep me and like-minded colleagues busy for some time to come,” he said. “The more you think about it, the more there is to do, but I’m not exactly losing sleep over it. Any sleep problems I have, are thanks to the recent arrival of my twin boys. But hey, I’m not complaining...”



Seminar series helps researchers to explore sociological facets of sleep

Together with Sara Arber of the University of Surrey, Simon has also been running a series of seminars on Sleep and Society. So far six of these—which have been funded by the Economic and Social Research Council (ESRC)—have taken place, and one more is planned.

The aims of the seminars have included:

- Promoting dialogue, debate and the sharing of expertise on the social world of sleep;
- Encouraging sociologists and social scientists to reflect on sleep as a new way of approaching or accessing social processes and social relations;
- Establishing new research collaborations, within and beyond the social sciences, as a basis for future studies and policy making on sleep and society.

Each seminar has brought together an international and interdisciplinary range of speakers, including historians, sociologists and psychologists. The topics have included:

- The management of sleep in everyday life;
- Sleep intimacy and family life;
- Children and sleep;
- Ageing and sleep;
- Sleep, health and medicine;
- Sleep, work time and work ethics.

The final seminar, due to take place in December 2006, will be on “Researching sleep: connections, challenges and future agendas”. (For full details, or to register, go to www.warwick.ac.uk/go/sleepandsociety.)

‘Women’s partners used sleep deprivation to exert control over them’

Simon said: “Many of the seminars covered issues that I had addressed or discussed in my book, but the seminars have provided an opportunity to take those issues forward in significant new ways by drawing others into this fascinating social world of sleep or sleeping.”

Some of the speakers, when first approached, claimed that they had not thought about sleep very much and/or had not done any research on sleep. “But we said, if you think further about it and/or look back at your existing research data, we are sure you will find a lot of material on sleep that you have not analysed yet, or that interpreting your existing data through the novel lens of sleep will yield some interesting new results,” Simon explained. In this way, he said, sleep is providing an important and, indeed, intriguing new way of reviewing and reconfiguring existing sociological research agendas.

A study by Pam Lowe, of Aston University, Birmingham, with Cathy Humphreys, formerly of the University of Warwick and now at the University of Melbourne, and Simon, shows how investigating the previously unexplored facet of sleep in relation to domestic violence mines a rich seam of information⁷. This paper reports on the sleep problems encountered by 17 women who had suffered domestic violence.

These women, who took part in focus groups, described how they restricted the place, time and amount they allowed themselves to sleep in order to increase their safety while they were living with violent partners. One would make sure her partner was asleep before she allowed herself to sleep; another would sleep until just before her partner was due back, then leave the house and return when he would be asleep; others would sleep with their children, or rest rather than allowing themselves to sleep deeply.

In many cases, the sleep problems of these women persisted even after they had been safely rehoused.

Lowe, Humphreys and Williams conclude that many of these women’s partners used sleep deprivation to exert control over them. Lack of sleep can have long-term implication for women’s physical and mental health, they add.

Another paper stemming from the same study⁸ has shown that children from families where there is domestic violence also experienced sleep problems, including nightmares, bedwetting and reluctance to sleep alone.

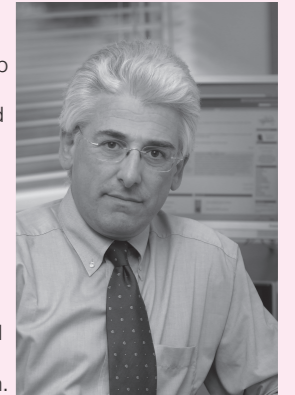
“There is an important message here for practice and policy,” Simon said. “Doctors and others in primary care who may be asked for help with sleeping problems need to be sensitive to these underlying problems and should explore carefully the potential reasons that may lie behind such seemingly mundane complaints as poor sleep quantity or quality.”



Exploring the links between poor sleep and obesity

Sleep disorders are common: an estimated one in 20 of us seek help from our doctors because we cannot sleep well¹. As well as insomnia, many people suffer from conditions such as snoring and sleep apnoea—a major cause of daytime sleepiness.

Yet, on average, medical students spend only 5 to 10 minutes of their training learning about sleep and sleep disorders. The University of Warwick is an exception—undergraduate students there already have the option of taking a Special Study Module (SSM) on sleep medicine, comprising 24 hours’ teaching in one term.



Ed Peile, the sub-dean of teaching in the medical school, who runs this module, is now working with Franco Cappuccio, recently appointed Cephalon Professor of Cardiovascular Medicine and Epidemiology, to encourage more students to take the sleep medicine module. Ed and Franco also want to develop a postgraduate teaching programme on sleep medicine.

Franco’s chair is endowed by the pharmaceutical company Cephalon Inc., based in the US, which is also supporting Franco to carry out a research programme of his own choosing on sleep.

Rather than concentrate on rare sleep disorders, or those that are difficult to diagnose, Franco has set out to study the impact of disturbed sleep in the population at large on wellbeing and general health. The research programme is called “Sleep, health and society”.

Franco said: “We want to describe and explore the links between short sleep and chronic conditions such as obesity, diabetes, hypertension and cardiovascular disease. Recent evidence from the US suggests that there is a link—for example, our review of the literature shows that, from age 5, children who sleep less tend to be more obese than those children who sleep longer hours per night.”

Collaboration on epidemiology

To try to understand the mechanisms that are responsible for such observations, Franco and his colleagues have set up collaborations with two well-known epidemiological studies that aim to determine the factors dictating people’s risk of developing chronic diseases such as diabetes and heart disease. These are the Whitehall II study in the UK and the Olivetti Heart Study in Italy.

Franco is also setting up additional studies that he hopes will shed light on the mechanisms linking sleep deprivation with, for example, obesity.

“It is possible that sleep deprivation is associated with activation of the body’s inflammatory responses, with the release of chemical messengers and other substances such as the interleukins, adhesion molecules and C-reactive protein,” Franco explained. “We already have evidence that chronic conditions such as obesity, diabetes, high blood pressure and heart disease are associated with a rise in these inflammatory molecules, and if sleep deprivation is too, this could provide a link between sleep deprivation and these chronic diseases.”

Michelle Miller, working in Franco’s team, is in charge of the laboratory work for this project, which will also look at levels of two hormones that are involved in the control of appetite and hunger. For this arm of the study, the researchers will measure (in a large population) the levels of ghrelin—produced by the stomach—and leptin, which is produced by adipose tissue (fat cells).

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