predictive control is based on predictions of glucose concentrations according to delivered insulin. A similar extent of glucose control as was shown by Hovorka and colleagues has been reached for overnight and non-early postprandial periods with both of these alternative algorithms combined with subcutaneous or intravenous glucose sensing and subcutaneous or intraperitoneal insulin infusion.[6–8,10,11]

However, trials testing proportional-integral-derivative algorithms have tackled glucose control at mealtimes. Early postmeal hyperglycaemia, followed by a secondary trend to hypoglycaemia, is the most common glucose profile.[6,7,10,11] Meal coverage of insulin needs could only be improved by hybrid semiautomated closed-loop insulin delivery, including a premeal manual bolus.[12] Glucose control at mealtimes will now be the challenge for Hovorka and co-workers and the other research groups who adopted model predictive control algorithms.[13] Because of the more complex effects that need to be considered for meal coverage, including the cephalic phase of insulin secretion, incretin's effects, and the variability of gut glucose absorption from mixed meals, model predictive control algorithms could offer more flexibility than do proportional-integral-derivative algorithms, as shown by Hovorka and colleagues after various meal compositions and physical activity. Individualisation of algorithmic variables will, however, be needed via a preliminary period of data acquisition during a warm-up monitoring-only phase. Meanwhile, overnight closed-loop insulin delivery will hopefully be implemented at home.

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Time for fair trade in research data

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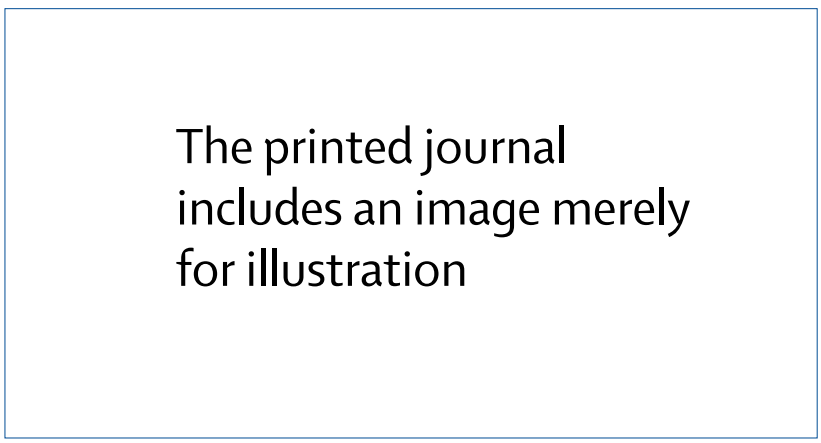
Geneticists, astrophysicists, and molecular biologists routinely share research data with colleagues and rivals alike. The reason is that scientists and their funders know we will understand complex issues sooner if people build on one another's work.[1,2] Yet scientists in the complex area of public health have been left behind in the data-sharing revolution.

If health researchers made their data available to colleagues, there would be less duplication of research and fuller use of study results. Data could be combined across time and countries to answer new questions, improving health policy. Data sharing would save time, effort, and money—it would probably also save lives.

Why do researchers not share data more? The obstacles are ethical, technical, and professional. Science funders, wanting more public health bang for each research buck, believe the obstacles can be overcome with the right investments and incentives. Researchers and journal publishers will play crucial roles. Many funding bodies are now reviewing their data-sharing policies. Researchers should engage to ensure that emerging policies meet their needs. A draft code on sharing public health data, the result of consultations between funders and international researchers, was discussed at the



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International Ministerial Meeting on Health Research in Bamako, Mali, in November, 2008.[3]

The ethical hurdles to sharing data are thrown up by concerns that secondary users might not respect the promises of confidentiality made to participants. But anonymisation and encryption technologies have come a long way: with sensible data access policies, data can be shared with minimum risk to individuals. Broad consent policies are already becoming common, while failure to maximise the use of data to improve people's health is under increased ethical scrutiny.[4]

The social sciences have shown that data sets containing personal information can be shared with minimum fuss. Biomedical data might require extended metadata standards and additional anonymisation to safeguard sensitive health information, but most of the hard work has been done by pioneers in other fields. The major technical hurdle for epidemiologists is to raise standards in the woefully neglected area of data management, which is no small task. In public health research, data-management capacity is limited; in developing countries, it is virtually non-existent.[5]

Data management is rarely treated as a discipline in its own right, so such management remains undervalued and underfunded, shoring up the professional hurdles to data sharing. Epidemiologists gain no credit for publishing datasets and data managers are rarely authors on publications. As long as funding and promotion depend on publishing papers in peer-reviewed journals, giving away data equates to giving away job prospects. The emphasis on publication discourages researchers from allowing others to analyse data they have collected, and stacks incentives against wringing the greatest knowledge from data in the shortest time.

Explicit policies from funders, journals, and universities laying out requirements and rewards for data sharing might coax more epidemiologists into the data-sharing age. Funders of public health research are increasingly requiring grantees to say how they expect to share research data. The US National Institutes of Health now require that data from their larger grants be made available to other researchers.[6] Some biomedical journals require a statement about data availability; in other fields, journals encourage researchers to submit a replication dataset with articles.[7,8]

No one is talking of the instantaneous release of machine-readable data. Protected fair-use periods for primary investigators and bona-fide access restrictions will probably become norms. Still, epidemiologists remain concerned about "giving away" data. Most worried of all are field researchers in developing countries, who do much of the hard graft in collecting data of interest to the global public health community. Senior scientists guiding small overworked teams in places with erratic electricity supplies and limited computing power do not have the time or the pool of skills available to do all the analysis they would like to. It will not help if they have to use their limited resources to manage data for analysis by academics from well-funded institutions in the developed world.

Sharing data can lead to new collaborations and increased funding, but examples are few and researchers remain wary.[9] With public health data, we need fair trade, not free trade. If funders wish developing world scientists to make their data available to others for secondary analysis, they must invest to give those scientists the skills to do primary analysis more rapidly. Secondary users and their funders will have to contribute, collaborating with primary researchers, learning about the dataset and passing on analysis skills. A history of publishing data must be recognised when reviewing grant applications. Metadata and archiving standards must be developed, data managers trained and supported, and data storage infrastructure expanded.

These developments will cost money, but many funders of research are prepared to make the investment. Genomics has taught us that investing in data sharing cuts duplication, speeds progress, and increases career opportunities for researchers. In public health, the dividend will also be better policies and healthier people.

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Dialysis dose in acute kidney injury and chronic dialysis

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The major function of the kidneys is to remove metabolic waste products. Patients with acute kidney injury, especially in the context of multiple-organ failure, are often highly catabolic, and hence have increased production of such waste products. This fact led to the idea that survival of such patients might be improved by increased removal of these toxins by renal replacement therapy. Two multicentre randomised trials that were designed to investigate the effect of dose of renal replacement therapy on outcomes in acute kidney injury have been reported. The RENAL study[1] failed to show a survival benefit of augmented doses of continuous renal replacement (40 mL kg^{-1} h^{-1} of haemofiltration *vs* 25 mL kg^{-1} h^{-1}). Similarly, in the VA/NIH study,[2] high doses of intermittent haemodialysis and continuous renal replacement for critically ill patients did not improve survival.

How do these findings in acute kidney injury relate to dialysis-dose needs in patients with end-stage kidney failure? The first randomised trial of dialysis dose, the NCDS study,[3] defined an adequacy threshold on the basis of small solute (urea) clearance by the dialyser (Kt/V; in which K is dialyser urea clearance, t the duration of dialysis session, and V the urea volume of distribution). Below a threshold sessional Kt/V of 0·9 for standard thrice weekly schedules, complication-free survival was compromised within months.[4]

In subsequent observational studies,[5,6] survival was improved at higher doses, and by consensus the target Kt/V was raised to 1·2.[7] A second randomised trial, the HEMO study,[8] showed that doses higher than 1·2 did not seem to further improve outcomes.[8] Subgroup analyses[9] suggested that women might benefit from increased Kt/V doses, fuelling suggestions that use of traditional Kt/V targets to prescribe dialysis potentially leads to underdosing in women and men with low bodyweight.[9] These studies suggested that, for standard thrice weekly therapy, medium-term survival (measured in months) crucially depends on achievement of a minimum amount of small-solute removal,[3] and that long-term survival (years and decades) needs improved clearance of small solutes.[8]

Researchers from the HEMO study also examined the benefits of dialyser flux and reported no overall survival advantage for high-flux membranes, which allow greater clearance of middle-sized molecules, such as β_2 microglobulin, than do low-flux membranes. However, with further subgroup analysis, they suggested that these membranes could confer a survival benefit in patients who had been receiving dialysis for more than 3·6 years at recruitment.[10] In the European MPO study,[11] a survival benefit from high-flux membranes was confirmed, albeit in high-risk patients. Considered together, these studies suggest that toxic effects of middle-sized molecules develop during longer timescales than do those for small solutes, and that accumulation of middle-sized molecules has almost no effect on short-term to medium-term survival.

What we can infer from these studies is that toxicity related to accumulation of solutes of small and