high probability of assault. The dose–response relationship is one of the Bradford Hill criteria of causation,[4] which outline the minimal conditions needed to establish a causal relationship between two items. In addition to the reported dose–response relationship, other criteria need to be fulfilled before one can establish a causal relationship between higher occupancy rates and violence. This study was unable to collect data relating to staffing variables and acuity levels of the wards, which may be associated with the incidence of aggression. Complex relationships have been reported between staffing, patient mix and violence. Risk of violence has been reported to increase with higher numbers of nursing and non-nursing staff on planned leave, of patients known to instigate violence, of disoriented patients, of patients detained compulsorily, and with more use of seclusion. Risk of violence has been reported to decrease with higher numbers of young staff (under 30 years old), of nursing staff with unplanned absenteeism, of admissions and of patients with substance misuse or physical illness.[5] It will be necessary for future studies to take into account other possible explanations (as mentioned above) and effectively rule out such alternate explanations in order to fulfil all of the Bradford Hill criteria, one of which is 'consideration of alternate explanations'.

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Authors' reply: We are of course pleased by Dr Kapoor's interest in our paper on overcrowding in hospital wards and physical assaults on staff.[1] The impact of overcrowding is a serious, albeit understudied, problem in healthcare research. In addition to the potentially increasing risk of violence perpetrated by patients, overcrowding has been shown to be associated with work overload in hospital staff and an increase in their risk of mental health problems.[2–4]

Dr Kapoor suggests that we were in error in reporting in the text that men were more likely than women to be working in high-occupancy wards. This is a misunderstanding. In Table 1, the proportion of men was indeed higher in overcrowded wards. More specifically, 264 of all 343 men in the study (77%) worked in wards with excess bed occupancy; 193 men (56%) worked in wards with the highest overcrowding. The number of women in overcrowded wards was 506, that is, 67% of all 755 women; 317 women (42%) worked in wards with the highest overcrowding. Conversely, 79 men (23%) and 249 (33%) women worked in wards with no overcrowding.

We agree with Dr Kapoor's view that simply by satisfying one of the Bradford Hill criteria of causation (in this case, temporality) does not provide sufficient evidence of a causal link between exposure and outcome. There is currently no consensus on the number of criteria required for determining whether an observed association is causal.[5] Dr Kapoor also referred to another of Bradford Hill's criteria – consideration of alternate explanations for a given association. Interpretation of findings from observational studies are inevitably constrained by concerns over confounding; that is, the role of unmeasured or poorly measured covariates. As we were careful to do in the paper, Dr Kapoor also describes some examples of such confounding factors.

We agree that the Overt Aggression Scale could provide interesting comparison to our findings. However, this scale (or its newer revised version) does not specifically measure physical assaults on staff, which was our study question, but instead a large spectrum of aggressive behaviours ranging from unspecified verbal aggression (loud noises, shouting) to physical attacks, which are not defined specifically as attacks on staff.[6] However, owing to the extra resources needed and their time-consuming nature, such detailed instruments are most suitable for smaller-scale studies. In a large study involving 1098 staff drawn from 90 bed-wards, use of those instruments would not have been feasible.

Finally, just as any discussion section based on analyses of observational data inevitably touches on the problem of confounding, though similarly trite, it is also true to state, as Dr Kapoor indicates, that additional studies are now required to replicate and extend our findings before we can conclude with certainty that overcrowding increases physical assaults on staff.

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