tinuous variables, such as jugular venous pressure, how is agreement compared and kappa calculated?

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**[Two of the authors respond:]**

Christopher Carpenter suggests another approach to teaching the kappa statistic: giving real data to the students and having them do the requisite calculations. Our approach takes them through the principles of the calculations, step by step. Calculating the kappa score from real data would be an excellent subsequent step for the most enthusiastic students. We encourage readers to consult the teachers' version of our article on the kappa score,[1] which has interactive components and data that may be helpful in understanding the concept of kappa.

Regarding the interpretation of kappa scores, Table 1 in both the teachers'[1] and learners'[2] versions of our article was based on a text by Sackett and colleagues[3] and not, as Carpenter correctly points out, the article by Maclure and associates.[4] Carpenter is also correct in noting that several different versions of this table are available in the literature. All have 3 basic categories: poor agreement, fair to good agreement, and very good to excellent agreement. In our view, further differentiating within these groups adds little to the practical clinical discussion.

Although we have never seen it in real life, David Juurlink and Allan Detsky correctly state that kappa can theoretically be less than 0 when agreement is poorer than chance. This is most likely to occur when both observers call almost every observation positive or almost every observation negative. In these circumstances, chance agreement would be close to zero and at times could be negative; determining chance-independent agreement (the phi statistic) may represent a better approach.[5]

Michael Allan asks about chance-corrected agreement when outcomes are categorical or continuous. One useful approach to this problem is the "weighted kappa," which gives maximal credit for full agreement, partial credit for partial agreement and no credit when disagreement is extreme. For example, in the case of ventilation-perfusion scans for the evaluation of pulmonary embolus, if both people reading a scan interpret the test result as normal (or both say there is intermediate or high probability of embolus), they get full credit for their agreement (weight of 1.0). If one reads the result as normal and the other as high probability, they get no credit (weight of 0). If one assessor classifies the scan as low probability and the other calls the same scan high probability or normal, they get partial credit (a weight of 0.75, for instance). Readers can find a more in-depth explanation and the details of how to calculate weighted kappa from the Web site of MedCalc Software (Mariakerke, Belgium; www.MedCalc.org).

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## More on India's HIV-1 epidemic

Paul Arora and colleagues,[1] in their overview of the HIV epidemic in India, appropriately identify known risk groups and possible contributors to the problem, focusing on heterosexual sex, specifically involving commercial sex workers. However, there may also be a need to revisit the relative contributions of other major groups.

One factor, the population of men who have sex with men (MSM), is rarely discussed because homosexual acts are illegal in India. Recent work presented at the International AIDS Conference in Thailand indicates that MSM may contribute substantially to the epidemic in both the homosexual and heterosexual communities. A recent survey of more than 3000 men in Andhra Pradesh found that over half of all anal sex acts between MSM were unprotected; in addition, almost half of the MSM were married, and more than half had had sex with a woman within the previous 3 months (and most of these encounters were unprotected).[2,3] MSM in India represent a hard-to-service group, as the stigma of homosexuality and the responsibilities of marriage make disclosure difficult.

The effective interventions proposed by Arora and colleagues[1] are essential to slow the rate of infections. Accomplishing this goal will require countrywide recognition of the HIV epidemic, sex education (both within and outside the classroom) and access to free voluntary counselling and testing, all of which must reach commercial sex

workers as well as MSM. We hope that Sonia Gandhi's presence at the AIDS conference in Thailand is a step toward official recognition of the issues inherent to the epidemic.

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### [Two of the authors and a colleague respond:]

We thank Edward Mills for pointing out, in response to our article on India's HIV-1 epidemic,[1] that men who have sex with men (MSM) are contributing to the HIV-1 epidemic in India. We think there are similarities between MSM and commercial sex workers, but also important differences.

In Andhra Pradesh state of India, about 40% of both MSM and commercial sex workers reported being currently married.[2] Similarly, 56% of MSM and 47% of commercial sex workers reported inconsistent condom use with male partners and paid clients, respectively.

But the sexual networks of commercial sex workers matter more than those for MSM in the growth of the HIV-1 epidemic. First, male clients or regular partners of commercial sex workers are more likely to spread HIV-1 further than are the wives of MSM. A national behavioural survey of 85 000 adults in 2001[3] found that 12% of males but only 2% of females reported nonregular sex partners in the previous year (for Andhra Pradesh, the comparable percentages were 19% and 7%). Second, the absolute number of commercial sex workers in the country may range from 5 million to 16 million.[4] The absolute number of MSM is not known but is probably lower. Thus, the annual absolute volume of partners is likely greater for commercial sex workers. Third, it is likely that the variation in sexual contacts among commercial sex workers is greater than that for MSM. The absolute volume of partners and its variance are key determinants of HIV-1 growth in mathematical models.[5]

We agree that more research is needed on MSM populations, including estimates of their size. If MSM are married, then the epidemiology of HIV-1 for this group and their partners may differ from that of MSM in Western countries. However, the overwhelming control priority is peer-based education on condom use, sexual and general health, negotiation skills and community collectivization efforts for female sex workers.[6]

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## Correction

In the third instalment of our series about evidence-based medicine,[1] the source of the qualitative classification of kappa shown in Table 1 was incorrectly cited. The correct reference is Sackett DL, Haynes RB, Guyatt GH, Tugwell P. *Clinical epidemiology: a basic science for clinical medicine*. 2nd ed. Boston: Little, Brown and Co; 1991. p. 30.

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