lection bias, our data suggest that catheter-associated BSIs are a significant problem in LTACHs. Further work is needed to characterize infection rates better and to design interventions to prevent BSIs in LTACHs.

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## Behavioral Explanation of Noncompliance With Hand Hygiene

We have read with great interest the article by Dr. Whitby and colleagues on a behavioral explanation for noncompliance with hand hygiene.[1] Compliance with hand hygiene has improved as a result of using alcohol-based hand rub, but still rarely exceeds 60% under study conditions. Therefore, new approaches and methods such as those suggested by Dr. Whitby are required to reach high rates of compliance. However, several issues have not yet been clearly addressed. The authors used focus group discussions to collect information, rather than applying written questionnaires. The results of these discussions are not given as percentages of positive or negative answers to questions, but as individual responses from participants. For example, Whitby et al. note that "mothers and nurses agreed that hand washing in the home is of lesser importance,"[1(p486)] and community attitudes toward hand washing are presented in Table 2. The statements in Table 2 are likely individual responses from select participants, but not a representative view of all participants.

Data from the focus groups were then used to create a questionnaire. Nurses were asked to complete this questionnaire, but the results are not given in detail. Sixty-one percent of the nurses responded to the questionnaire; no data were available on the reasons for nonparticipation. In most studies, some questions are not answered, and such data should be given to estimate the potential of a bias in this study.

Whitby et al. assert that "translation of community handwashing behavior to healthcare settings is the predominant driver of all handwashing...."[1(p484)] This statement may be true in countries where hand washing with soap and water is the standard of care in healthcare institutions, but may not be applicable to countries in Europe, where use of alcohol-based hand rub is the standard of care in healthcare institutions. Since alcohol-based hand rub is rarely used in European households, the translation from community hand washing standards to the use of alcohol-based hand rub in healthcare institutions in such countries may not be applicable as it might be in Australia.

Whitby et al.[1] state that only a small increase in adherence to hand hygiene guidelines may be seen after introduction of alcohol-based hand rub. In many other studies, sufficient time to perform hand hygiene was the key factor in improving compliance[2-4]; likewise, staff shortage was a risk factor for transmission of pathogens.[5,6]

We congratulate Whitby et al.[1] on their efforts to expand current techniques to improve adherence with components derived from the "Theory of Planned Behavior." However, the results of their study should not impede or delay implementing the use of alcohol-based hand rub in institutions where hand washing with soap and water is still the standard of care. In addition, behavior changes in healthcare institutions require tremendous effort, a long-standing commitment, and special education of trainers. The change from hand washing with soap and water to the use of alcohol-based hand rub will increase compliance, and the transition should not be postponed because of the lack of a concomitant behavior modification program. It also would impede the Word Health Organization efforts in 2006 to promote the use of alcohol-based hand rub as the standard of care.[6]

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## Reply to Widmer

TO THE EDITORS—We thank Dr. Widmer[1] for his comments on our article,[2] but believe that he has misunderstood both our methodology and conclusions. Dr. Widmer[1] makes criticisms in 4 broad areas: methodology, nonresponders, external generalizability, and the benefits of using alcohol-based hand gel.

With respect to methodology, although clinicians are usually more familiar with research outcomes grounded in numerical associations, the use of focus groups is a validated methodology in behavioral science[3,4] and has been widely applied for some decades to many areas of research, including medicine and commercial market research. Focus groups are designed to explore uncertain or unknown paradigms of behavior and to determine the uniformity or nonuniformity of participants' perceptions by means of thematic analysis. Our presentation of statements made by participants during focus group discussions (Tables 1–4 of our article[2]) is conventional practice and is designed to reflect common and consensual themes detected in all focus groups. These are not just the opinions of selected individuals.

With respect to the issue of nonresponders, the reasons that 39% of nurses chose not to complete our questionnaire are unknown; this is an issue common to all studies in which participation is by choice and subjects remain anonymous. Individual response rates for each of the questions in our survey were omitted for brevity—our analyses did, however, use sophisticated modeling in which those participants who responses were incomplete for items being tested were excluded. The variance ($R^2$) values illustrated represent a more informative statistic. They indicate the proportion of the behavior that is explained by the predictors in the model; this is reliant on response rate. Our model explained a high proportion (62% and 76%) of the variance in hand hygiene behaviors; models that explain only 30%-40% of the variance in a complex behavior are regarded as acceptable.

With respect to external generalizability, we disagree with Dr. Widmer's conclusions that our findings are not relevant to Europe or, for that matter, North America.[1] Contrary to his suggestion, alcohol-based hand rub is not widely used in the Australian community. Of more import, the shared history, traditions, and cultural values of the nations within Europe, North America, and Australia suggest that it is very likely our findings are applicable to healthcare workers from all of these areas.

We have also provided evidence from work in Africa that may suggest the universality of our conclusions in relation to handwashing. This needs further study and we are currently repeating our investigations in the People's Republic of China, a country with a sophisticated community structure but without culture and traditions inherited from Europe.

With respect to the benefits of alcohol-based gel, we are aware that healthcare workers frequently cite a lack of time as their reason for noncompliance with hand hygiene protocols. We do not dispute this assertion but have argued, on the basis of our focus group discussions and modeling evidence, that this applies only to the elective component of hand hygiene behavior. In those circumstances where healthcare workers perceive a risk to themselves (ie, "inherent" handwashing), they are highly likely to wash their hands regardless of time constraints. It may well be, as we state in our paper, that the availability of alcohol-based gel facilitates improved elective hand hygiene behavior by reducing the time necessary to clean the hands. However, our findings strongly indicate that the effect of introduction of alcohol-based gel alone is small, and the potential response to the modification of other behaviors that drive compliance is much greater. We readily agree with Dr. Widmer[1] that changing behavior is a difficult process; given our failure over the past 25 years to influence hand hygiene compliance using authority, education, and reinforcement as techniques, an approach focused on identifying and targeting significant facilitators of this behavior may offer greater promise.

Finally, we do not decry the use of alcohol-based hand rub in hospitals and are familiar with the World Health Organization (WHO) Hand Hygiene Program (M.W. and M.-L.M. are members of the WHO Technical Advisory Committee on Handwashing). However, the hand hygiene practices of healthcare workers are learned behaviors from childhood, which are continued in a professional context and reinforced in everyone's daily lives. We strongly caution against un-