and questionnaire scores, but a subgroup of women—namely, those with low cholesterol concentrations (lowest 5% of the population)—had significantly poorer mental health as indicated by their questionnaire scores (p < 0.04).

Although we found a significant relation only in the women, these data suggest that low cholesterol concentrations may be associated with altered mood. The difference between the sexes was unexpected as the impact of changes induced by diet or drugs has tended to be studied in men, and Lindberg and colleagues found an association between cholesterol and suicide only in men. Our study, however, was of subjects younger than those in similar studies. Our finding, in a relatively small sample, suggests that use of similar psychological methods, rather than the rate of suicide, may allow this topic to advance more rapidly.

Data suggest that particular attention should be directed at those with low cholesterol values.

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Editor.—In their long term follow up of adults who participated in the Värmland survey in Sweden, Gunnar Lindberg and colleagues report a significantly higher incidence of suicide and violent deaths in middle aged and elderly men whose cholesterol concentrations were in the lowest quarter of those surveyed. This difference in violent deaths was limited to the first seven years of follow up. A cause and effect relation is suggested.

Suicide and risk taking behaviours are commonly found among middle aged or elderly men with psychological depression. Loss of appetite and weight loss are characteristic of this state or illness, and loss of over 5% of body weight is regarded as one of the diagnostic characteristics of acute depressive illness. Weight loss is associated with a fall in serum total cholesterol concentration.

Among middle aged men 2.5%-3.2% are estimated to have an acute depressive illness at any one time, while others may suffer from reactive depression based on losses and social misfortune. Thus in the Värmland study a sizeable group of men might be expected to have been depressed at the time of the survey. Most of these would have recently lost weight or been losing weight. For many of them their cholesterol concentrations would have fallen, or been falling, into the lowest quintile at that time. This would be a risk for violent death from suicide or risk taking behaviours during the ensuing months or few years.

Lindberg and colleagues found no relation between low cholesterol concentrations and suicide in women. Depressed women are much less likely to commit suicide than are depressed men. The authors noted no significant interaction between cholesterol concentrations and suicide with age. They do not report the relation between cholesterol concentrations and body mass index in the survey, although body mass index was included in the survey.

What the study probably indicates is that men who met violent deaths, commonly from suicide, had been depressed for some time beforehand and, because of weight loss, had lower serum cholesterol concentrations.

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David Benton and Joyce Fordy suggest that low cholesterol concentration is associated with low mood. Even though their own data provided no support for this in men it is thought provoking, especially in the light of a recent hypothesis about poor suppression of harmful behavioural impulses in subjects with low cholesterol.

Alan J Goble and Marian C Worcester suggest that we try the possible confounders, in the past of loss of appetite in the depressive state, by adjusting for body mass index. The correlation between total cholesterol and body mass index in our cohort as well as in other populations was low (r=0.11 in men), and thus it is unlikely that this analysis should provide any new information. As they state, there is a higher correlation between weight change and cholesterol change, but only one recording of both variables is available in the Värmland study, and thus no correction is possible.

Confounding from a highly energetic and active lifestyle is a possible direction, worth investigating in future studies. The same is true for ill health, which we ruled out as far as possible by excluding subjects included on the registry.

All these explanations are, as far as present knowledge allows us to conclude, equally probable and it would if possible be available in future studies of the impact of total cholesterol concentration on disease incidence and mortality.

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Vaccination against Haemophilus influenzae b disease

Editor.—Keith A V Carwright states that Haemophilus influenzae b vaccine may be given concurrently with diphtheria, tetanus, and pertussis vaccine or with messels, mumps, and rubella vaccine into a different limb.7 The latest edition of the UK childhood vaccination schedule recommends that Haemophilus influenzae b vaccine should be given in the anterolateral mass of the thigh and that pertussis vaccine should be given in the deltoid muscle.8 This advice is consistent with the information given in the schedule for the United States.9

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2 Vaccination against Haemophilus influenzae b disease: BMJ 1992;305:277-9. (1 August.)

Authors’ Reply.—We concluded firmly that although the results suggested an association between the risk of suicide and cholesterol concentrations in men, the direction of this relation was not resolved. We were hesitant to speculate too far on this, but several explanations have been brought up in this correspondence.

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9 Site of injection for vaccination

Editor.—ColinPayton illustrates the validity of my concern over the misconception of many who administer vaccines that the deltoid area is a superior site for injection.

There are no data comparing vaccine absorption in the muscles of the deltoid region and the anterolateral aspect of the thigh, but there is no valid reason to suspect that any differences exist.