Etiological studies of traumatic injury: are we measuring the right outcome?

William Pickett, John R Hoey

A description of the issue
Many etiological studies investigate risk factors for the occurrence of acute injury events. The epidemiological approaches used in such investigations include case-control studies, where people are classified based on the occurrence or non-occurrence of an injury and the exposure experience of the two groups is compared. Alternatively, some studies use a cohort approach, which in its simplest form, compares the injury experiences of people over time who have and have not been exposed to a potential risk factor. We have been considering the methods currently used to classify injury outcomes in these types of studies and would like to share these ideas with the readers of Injury Prevention, in the hopes of involving some thought and debate.

By definition, the purpose of etiological studies is to quantitatively assess the strength of potential risk factors for injury. For example, an investigation might examine how family income levels (or some other measure of socioeconomic status) are associated with the occurrence of certain childhood injuries. What we would normally do in this situation is to classify the outcomes in a dichotomous fashion (that is, as injury or no injury), and perform our analysis based upon this outcome measure. While this is a straightforward and generally accepted method, we wonder whether it is appropriate for all etiological studies. Many injury control specialists view injuries as a form of disease, and this view provides us with a conceptual framework from which preventive interventions can be formulated. But what if acute injury events are really manifestations of a disease process? What if that process is real and the injury only a proxy measurement for the existence of this disease?

If we were to accept this idea it might lead to a change in the way we view and measure injuries. Instead of considering injuries to be acute events leading to physical harm, we would need to broaden the definition to include a disease where individuals consistently (and perhaps systematically) place themselves at risk for injury.

What would this injury ‘disease’ look like?
It is difficult to debate whether this disease actually exists in the absence of a clear, working definition. Although we have not developed this definition in any detail, the disease might be characterized, in broad terms, as including a personal, social (and possibly even, genetic) environment that fosters or accepts risk taking on a day-to-day basis, in combination with a reduced ability to avoid episodes of risk. This idea is different from the old theory of ‘accident proneness’. This definition should be based upon exposures that foster risk and a lack of risk avoidance, as opposed to the fatalistic view that some people have an innate susceptibility to injuries for no apparent reason.

To illustrate, one of our research group’s major interests is farm injuries. A subpopulation consistently at risk in this setting are young boys. The personal and social characteristics of some farm environments, that foster risk and lead to its acceptance, include the constant need for manual labour combined with the expectation that adolescent males are capable of handling hazardous tasks and long working hours. Coupled with these environmental risks is the fact that young boys are still maturing and may lack the stamina and coordination to consistently avoid farm work hazards. All these factors create a situation where the boys are consistently working at high risk. This provides one example of a set of environmental and personal conditions that might constitute this ‘disease state’ so that injuries occur frequently.

Implications of this idea for etiological studies of injury
There are some important methodological implications associated with this idea. As injury control researchers, it might be important to re-focus some of our etiological work on associations between potential risk factors and the presence of this disease, and not continue to focus solely on risk factors for injuries. For example, instead of examining only associations between socioeconomic status and the occurrence of injuries, we should also investigate the association between socioeconomic status and the occurrence of the risk taking disease. This could provide a clearer picture of the true etiology of the conditions that lead to injury.

Our current method of classifying diseased and non-diseased people in injury studies (that is injured/non-injured) might obscure the true etiological relationships of importance. Those who have not yet had an injury would currently be misclassified as ‘non-diseased’. The classification of those who are truly non-disease would be unaffected. If a true association existed between some factor and the occur-
rence of this newly defined disease, it would be
difficult to detect if outcomes were determined
only according to the presence or absence of
injury events, as opposed to this more refined
measure.

Further, in the development of multivariable
etiological models, one guiding principle is
never to adjust for variables unless we under-
stand how they relate to both the exposure and
the outcome. If one accepts our proposition
(that we are not measuring this outcome appro-
priately), this means that we may not be
developing appropriate etiological models. We
might be considering variables as risk factors
contributing to the occurrence of disease when,
in fact, they are actually part of the disease
process. Adjustments for these variables could
lead to biased estimates of risk being attributed
to the underlying risk factors. More impor-
tantly, this would lead to inappropriate recom-
mendations for preventive intervention.

Conclusion
The purpose of this Opinion is to share
thoughts about whether injury researchers are
employing the correct outcome in the conduct
of etiological studies. We offer these ideas not
as definitive statements based on objective
information, but as possibilities that require
consideration and debate. If the ideas are
legitimate they are certain to have some appli-
cation in future investigations.

DISSENT

Risk taking disease

Stephen Jarvis

The Opinion paper by Pickett and Hoey opens
a can of worms! Any dissent from these slippery
worms may prove difficult, but I hope to
convince readers that this particular can should
be kept shut — but then reopened from the
other end!

The reasoning will follow the line — what is
this new disease (risk taking disease)? — how
would I know I had it? — can this disease
actually be located in a specific person? — how
would an epidemiologist find its associated risk
factors? — how does risk taking disease stand
up to accepted definitions of disease? — what
alternative might improve the situation?

What is risk taking disease?
Although the authors admit that they have not
developed this definition in any detail' it is
possible to tease out a couple of summary
strands describing their concept. For instance,
they suggest that 'a record of an injury' may be
only a proxy measurement for the existence of
this disease'. Later they suggest 'the definition
of each disease' should be based upon
exposures that foster risk and a lack of risk
avoidance'.

How would I know when I've got risk
taking disease
First of all, I don't seem to need an injury.
Rather it seems clear that the authors would
characterise this disease by measures of
'exposures that foster risk' and separate
measures that capture 'ability to avoid episodes
of risks'. Perhaps this might be encapsulated as
'what hazards does the environment present
and how do people react to this? To address the
second half of this question one might need to
go beyond behaviour variations in the face of
specified hazards to include attitudes towards
risk seeking, or even further to include physical
and psychosocial variations in risk perception.
Whatever the refinements, however, a central
dimension is the measurement of exposure to
risk of injury, irrespective of whether the
balance of attributability is environmental or
behavioral.

How would an epidemiologist study risk
taking disease?
Comparing the rate of events per unit (or
degree of) exposure to postulated risk factors is
a basic epidemiological tool when examining
etiology. Defining disease by exposure to risk
factors is, therefore, likely to be circular. If risk
taking disease is defined as above, then the
relevant risk factor/exposures are those that
might predict this particular combination of
primary exposures (that is, risk taking disease).
There is a danger that rates of this disease per
unit of secondary risk factor exposure will fail
to predict ultimate injury outcomes. For inst-
ance, injury and secondary exposure could be
independently related to its frequency (that is
the disease may be a confounder). Further-
more, in experimental studies, the disease
might be cured by altering the physical
environment in which somebody lives!