Understanding drinking and driving reforms: a profile of Ontario statistics

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Drinking and driving has been the subject of considerable public concern and legislative attention in many countries in recent years. In Canada, the federal criminal laws and provincial traffic acts have been significantly amended since the mid-1980s: police investigatory powers have been broadened, new federal crimes and provincial offences have been enacted, and more onerous penalties and administrative sanctions have been introduced.

The most recent cycle of Canadian legislative reform has focused on increasing sanctions, particularly for repeat offenders. Federal Criminal Code amendments in 1999 increased the minimum fines and driving prohibitions for the three most common offences—impaired driving, driving with a blood alcohol level (BAL) above 0.08%, and failing to provide breath or blood samples. Significant changes have also occurred at the provincial level. For example, Ontario introduced legislation which, when fully implemented, will impose indefinite licence suspensions on those convicted of three federal drinking and driving offences within 10 years, and British Columbia has followed suit. Both the federal and provincial governments have widely publicized their “get tough” legislation.

However, Mothers Against Drunk Driving (MADD) Canada and other organizations have questioned whether these initiatives will have a significant impact. Stiffer penalties are unlikely to have much effect if the police do not have sufficient resources to apprehend and charge drinking drivers, or if prosecutors are so overburdened that they can only act in the most serious and blatant cases.

We had hoped that a review of Ontario’s drinking and driving statistics would shed some light on enforcement, prosecutorial and sentencing practices, and on the likely impact of the new “get tough” legislation. However, it was surprisingly difficult to obtain much information from the provincial government. Although Ontario published statistics on its federal drinking and driving convictions, it did not publish comparable information on the number of charges. Unfortunately, federal statistics were also limited. They did not address what happens before the police decide to lay a charge, nor what happens to the charge before the accused’s first court appearance.

Despite these limitations, federal data provided some insight into basic issues of charging, prosecutorial, and sentencing practices in Ontario. They suggested that there were—and remain—serious problems with these practices. Because the recent federal and provincial amendments did not address the underlying problems, we share the concerns of MADD and others about the likely effects of the legislative reforms.

Methods

This study uses data provided by the Canadian Centre for Justice Statistics (CCJS), relating to the following Criminal Code offences: driving while one’s ability to do so is impaired by alcohol or a drug; driving with a BAL above 0.08%; failing to provide breath or blood samples; impaired driving causing bodily harm or death; and driving while prohibited or suspended. The CCJS data are limited to charges that resulted in an appearance in the Ontario Court (Provincial Division) and only include cases disposed of during the 1996–97 reporting period. They are further limited to cases involving adults. Consequently, we do not have information on the number or percentage of drivers:

- Who, despite evidence of drinking, were not required to take a roadside screening test;
- Who “failed” (BAL >0.08%) a roadside screening test, but were not required to submit to breath testing on an approved instrument (breathalyzer);
- Who failed a breathalyzer test (BAL >0.08%), but were not charged;
- Who exhibited signs of impairment, but were not charged with impaired driving;
- Who were charged with a drinking and driving offence under the Young Offenders Act;
- Who were charged, but whose charges were withdrawn before a court appearance;
- Whose charges were reduced to a provincial offence, such as careless driving,
- Before their first court appearance;
- Whose cases were transferred to, and disposed of in, the Ontario Court (General Division).*

Thus, the data do not directly address many of the concerns about enforcement practices before the accused’s first court appearance.
Despite these limitations, the findings reported below are revealing and disturbing.

Terms
The public and media often view the conviction rate for an offence as an indicator of police and prosecutorial effectiveness. However, there is no simple way to determine the conviction rate for the various drinking and driving offences. Unless certain background information is understood, simple reference to conviction rates is confusing. The term “conviction rate” may refer to the number of guilty dispositions relative to the total number of charges, or to the number of guilty dispositions relative to the total number of persons charged.

A second complication relates to the charging practices of police and prosecutors. Most drinking and driving suspects are charged with more than one offence. For example, most suspects charged under the impaired driving section of the Criminal Code are charged with both impaired driving and driving with a BAL above 0.08%. After a plea or finding of guilt on the first charge, the second charge is withdrawn or stayed. Similarly, many offenders who are charged with both failing to provide samples and impaired driving are convicted of only one of these offences.

It is important to understand the basis on which such charges are withdrawn or stayed. In R v Kienapple, the Supreme Court of Canada held that an individual cannot be convicted of two criminal offences arising from a single act, and this principle has been applied to impaired driving and driving with a BAL above 0.08%.

Therefore, if the accused is convicted of one of these offences, the other must be withdrawn by the prosecutor or stayed by the judge. The Canadian courts have held that driving while impaired and failing to provide samples involve distinct acts. Consequently, the Kienapple rule does not apply, and the accused may be convicted of both offences. Nevertheless, it is common practice for prosecutors to withdraw charges for the remaining offence if the accused has been convicted of the first.

This information on conviction rates, multiple charges, the Kienapple rule, and prosecutorial discretion to withdraw charges must be kept in mind while reading the following analysis.

Results: statistical review
We analyzed the dispositions of charges, pleas, and sentences for federal drinking and driving offences involving adults appearing in the Ontario Court (Provincial Division) in 1996–97.

Disposition of charges
Table 1 divides dispositions into four categories, the largest of which are “guilty” dispositions, and stays and withdrawals (S/W). The former includes both guilty pleas and findings of guilt. The latter refers to cases in which the judge stayed proceedings or the prosecutor withdrew the charge. “Other” includes charges transferred to the Ontario Court (General Division) and a small number of cases in which the accused was found unfit to stand trial.

As seen in the table, guilty dispositions accounted for roughly 50% of the total. This low percentage of guilty dispositions and the variation among offences is partly attributable to charging practices, the Kienapple rule, and prosecutorial policies. However, it also reflects the elements and seriousness of the specific offences.

Table 1 also indicates that few cases, regardless of the offence, result in acquittals. It may initially appear that the low acquittal rate is due to effective enforcement and prosecution. Alternatively, the low number of acquittals may reflect an overly cautious approach, in that police only lay charges and prosecutors only go to trial when there is overwhelming evidence of guilt. Both explanations are plausible. However, concerns expressed by court observers, as well as enforcement officials’ own statements about limited resources and their practices in charging suspects, suggest that the low acquittal rate is largely due to selective enforcement and prosecution.

1 Impaired driving and driving with a BAL above 0.08%
These offences account for 86% of charges and dispositions in the Ontario Court (Provincial Division). As indicated, drivers are typically charged with both offences. However, as a result of the Kienapple rule, once the accused pleads or is found guilty of one offence, charges for the other must be stayed or withdrawn. There are more guilty dispositions and fewer stays and withdrawals for impaired driving than for driving with a BAL above 0.08%. According to police and prosecutors, this results because impaired driving is listed first in the Criminal Code section and on the police information. Once the accused pleads or is found guilty of impaired driving, the charge of driving with a BAL above 0.08% must be

Table 1 Disposition of drinking and driving charges by offence, Ontario, 1996–97 (%)

<table>
<thead>
<tr>
<th>Offence</th>
<th>Guilty</th>
<th>Acquitted</th>
<th>S/W</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired driving</td>
<td>12 042  (60.2)</td>
<td>155 (0.8)</td>
<td>7 684 (38.4)</td>
<td>132 (0.7)</td>
<td>20 013 (100)</td>
</tr>
<tr>
<td>BAL &gt; 0.08%</td>
<td>8 819 (39.2)</td>
<td>172 (0.8)</td>
<td>13 342 (59.2)</td>
<td>187 (0.8)</td>
<td>22 520 (100)</td>
</tr>
<tr>
<td>Failing to provide samples</td>
<td>1 318 (51.9)</td>
<td>30 (1.2)</td>
<td>1 163 (45.8)</td>
<td>29 (1.1)</td>
<td>2 540 (100)</td>
</tr>
<tr>
<td>Impaired/bodily harm</td>
<td>213 (90.7)</td>
<td>6 (1.1)</td>
<td>225 (92.7)</td>
<td>92 (17.2)</td>
<td>536 (100)</td>
</tr>
<tr>
<td>Impaired/death</td>
<td>23 (31.1)</td>
<td>0</td>
<td>30 (40.5)</td>
<td>21 (28.4)</td>
<td>74 (100)</td>
</tr>
<tr>
<td>Driving while prohibited</td>
<td>2 686 (74.1)</td>
<td>12 (0.3)</td>
<td>863 (23.8)</td>
<td>64 (1.8)</td>
<td>3 625 (100)</td>
</tr>
</tbody>
</table>

S/W = stays and withdrawals.

*Depending on the offence and how it is prosecuted, the accused may have a choice to be tried in the Ontario Court (General Division), which is a higher court than the Provincial Division. However, the rules governing jurisdiction are very complex. The names of the Ontario Court (Provincial Division) and the Superior Court of Justice, respectively. In this paper we refer to these courts by the names that applied in 1996–97.
stayed or withdrawn. The number of acquittals for both offences is low.

(2) Failing to provide samples
The small number of charges for failing to provide a sample (2540) stands in sharp contrast to the large number of charges for driving with a BAL above 0.08% (22 520), which indicates that the overwhelming majority of suspects comply with the police demand for samples. As with impaired driving and driving with a BAL above 0.08%, about 50% of those charged with failing to provide samples plead or are found guilty. However, because the elements of this criminal offence are relatively straightforward, one would have anticipated a higher rate of guilty dispositions. This low rate of guilty dispositions and the high rate of stays and withdrawals (45.8%) are largely attributable to prosecutorial policy. Since the Kienapple rule does not apply to these offences, the accused could be convicted of both offences. Nevertheless, it appears to be common practice for prosecutors to withdraw the charge of failing to provide breath or blood samples, once the accused is convicted of impaired driving.

(3) Impaired driving causing bodily harm and impaired driving causing death
One of the most striking features of these statistics is the relatively small number of charges. The Traffic Injury Research Foundation has estimated that 41.3% of Ontario’s 1164 traffic fatalities in 1995 were alcohol related.¹⁵ Even after taking into account crashes in which the drinking driver died, multiple fatality crashes, and cases in which the drinking driver was not impaired or the driver’s impairment was not a cause of the death, the number of charges for impaired driving causing death (74) is low. Similarly, given that 15%–30% of Ontario’s 89 572 traffic injuries were alcohol related,¹⁵ the number of charges for impaired driving causing bodily harm (536) is also low.

The percentages of guilty dispositions for impaired driving causing bodily harm (39.7%) and impaired driving causing death (31.1%) are extremely low. This is probably due to several factors. First, as those convicted are usually sentenced to prison and lengthy driving prohibitions, one would expect these accused to defend the charges aggressively. Second, proving the causal element of these offences is often difficult. Establishing that there was an injury or death and that the driver was impaired is relatively straightforward. However, it may be more difficult to prove beyond a reasonable doubt that the driver’s impairment, and not other factors, was the cause of the injury or death. Although the established test requires prosecutors to prove only that the driver’s impairment was a cause beyond an insignificant level, many courts apply a more stringent test.¹⁷ Third, a significant number of the bodily harm (17.2%) and death cases (28.4%) were not resolved in the Provincial Division, but were instead transferred to the General Division. Given the low percentage of guilty dispositions and the high percentage of stays and withdrawals, it appears that many suspects initially charged with impaired driving causing death or bodily harm were able to get these charges withdrawn in exchange for a guilty plea to impaired driving—a lesser offence.

Acquittal rates for impaired driving causing bodily harm and death are also very low. As indicated, this may be due to rigorous enforcement and prosecution, or to an overly cautious approach. Given the statistics, the latter explanation is more compelling. Relatively few charges are laid, and a significant percentage of these are withdrawn, in exchange for guilty pleas to lesser offences. Presumably, cases actually brought to trial involve overwhelming evidence of guilt.

(4) Driving while prohibited
This offence has the highest rate of convictions (74.1%) and the lowest rate of stays and withdrawals (23.8%). The high rate of guilty dispositions is probably due to the fact that the elements of this offence are easy to prove. Moreover, this offence does not overlap with the other drinking and driving offences, and therefore, the Kienapple rule does not apply. Finally, given the distinct nature of this offence, prosecutors are not likely to exercise their discretion to withdraw the charge if the offender has been convicted of another offence.

PLEAS TO DRINKING AND DRIVING CHARGES
Table 2 outlines the pleas that the accused entered in the Provincial Division before the disposition of the case. The “other” category includes cases in which the accused pleaded guilty to another Criminal Code offence. The “unknown” category consists of cases transferred to the General Division and cases in which the charges were withdrawn or stayed.

Much of the earlier discussion is relevant to understanding table 2. The large number of cases in the “unknown” category reflects the significant percentage of charges withdrawn or stayed. This is largely attributable to the Kienapple rule when the accused is charged with both impaired driving and driving with a BAL above 0.08%, and to prosecutorial practice when the accused is charged with both impaired driving and failing to provide breath or blood samples.

<table>
<thead>
<tr>
<th>Offence</th>
<th>Guilty</th>
<th>Not guilty</th>
<th>Other</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired driving</td>
<td>11 072 (55.3)</td>
<td>846 (4.2)</td>
<td>33 (0.2)</td>
<td>8 062 (40.4)</td>
<td>20 013 (100)</td>
</tr>
<tr>
<td>BAL &gt;0.08%</td>
<td>7 916 (35.2)</td>
<td>843 (3.7)</td>
<td>14 (&lt;0.1)</td>
<td>13 747 (61)</td>
<td>22 520 (100)</td>
</tr>
<tr>
<td>Failing to provide samples</td>
<td>1 091 (43)</td>
<td>224 (8.8)</td>
<td>2 (&lt;0.1)</td>
<td>1 223 (48.1)</td>
<td>2 540 (100)</td>
</tr>
<tr>
<td>Impaired/bodily harm</td>
<td>160 (20.9)</td>
<td>14 (2.6)</td>
<td>4 (0.1)</td>
<td>324 (40.4)</td>
<td>536 (100)</td>
</tr>
<tr>
<td>Impaired/death</td>
<td>20 (27)</td>
<td>1 (1.4)</td>
<td>2 (2.8)</td>
<td>51 (68.9)</td>
<td>74 (100)</td>
</tr>
<tr>
<td>Driving while prohibited</td>
<td>2 630 (72.6)</td>
<td>57 (1.6)</td>
<td>1 (&lt;0.1)</td>
<td>937 (25.8)</td>
<td>3 625 (100)</td>
</tr>
</tbody>
</table>
In cases of impaired driving causing bodily harm or death, plea arrangements likely accounted for a sizeable percentage of the stays and withdrawals. Generally, these arrangements involve the accused pleading guilty to impaired driving in exchange for the prosecutor withdrawing the charge of impaired driving causing bodily harm or death. Table 2 establishes that few accused drivers pleaded not guilty. Based on the total number of acquittals for all offences derived from table 1, fewer than 20% of drivers who initially pleaded not guilty were actually acquitted.

SENTENCES IN DRINKING AND DRIVING CASES

Table 3 classifies the sentences offenders received. The table is more complicated to interpret than it would initially appear. First, many offenders would have received more than one type of sentence, such as a jail term and a fine, or a probation order and a fine. However, each case is recorded under only the most serious type of sentence—with jail being more serious than probation, which in turn is more serious than a fine. Second, impaired driving, driving with a BAL above 0.08%, and failing to provide samples are dual procedure or hybrid offences. This means that the prosecutor has discretion to try the case by summary conviction or indictment. The Criminal Code provides heavier maximum sentences for these offences if they are tried by indictment. Consequently, the prosecutor’s decision on how to proceed will likely have a significant effect on the sentence. Unfortunately, the federal data on which table 3 is based do not indicate how these cases were tried. However, unless the accused has several previous convictions or the conduct is particularly blameworthy, these offences are rarely tried by indictment. Third, table 3 does not indicate the percentage of cases that involve repeat offenders, even though this information is essential in assessing sentencing patterns. What many people regard as an appropriate sentence for a first offender may be considered a lenient sentence for a repeat offender.

The task of determining what percentage of Ontario offenders have prior convictions is challenging. There were several reports that put the figure at approximately 66%, but these were based on Ontario Ministry of Transportation data which the Ministry subsequently indicated was incorrect. The new data provided by the Ministry put the figure at about 34%. However, the Ministry’s explanation for this discrepancy and the methodologies used lead the authors to believe that the 34% figure may be low.

In any event, it would appear that a significant number of repeat offenders are, in fact, sentenced as first offenders. The Criminal Code imposes mandatory jail terms on those convicted of a second, third, or subsequent impaired driving offence. Thus, one would expect all of these repeat offenders, and at least some of the first offenders, to receive a jail sentence. However, as table 3 indicates, in total only 27% of those convicted of driving while impaired, driving with a BAL above 0.08%, and failing to provide samples received a jail sentence.

There are several explanations for this. Unless an offender admits his or her record in court, the prosecutor must prove it. Generally, prosecutors will not use a prior drinking and driving conviction to classify the accused as a repeat offender if the conviction occurred five or more years ago. In other cases, the prosecutor may agree, as part of a plea or sentence agreement, not to introduce the offender’s record. If an accused pleads not guilty at his or her first court appearance, the prosecutor may not even be aware of the offender’s record. Finally, the prosecutor may be aware of the offender’s record, but unable to prove it. Many drinking and driving suspects are not fingerprinted, and, without such confirmation, it may be very time consuming to prove conclusively that an offender has a prior drinking and driving conviction.

(1) Impaired driving, driving with a BAL over 0.08%, and failing to provide samples

As table 4 illustrates, the Criminal Code requires judges to impose mandatory minimum penalties for all three offences. These penalties increase if it is established that the offender has a previous conviction. Turning to table 3, it should be noted that the overwhelming majority of the offenders who actually received jail terms for these offences would have been repeat offenders. Since the Criminal Code imposes a mandatory jail term on all repeat offenders, those who received only probation or a fine are being treated as first offenders. As indicated, a significant number of repeat offenders are sentenced as first offenders, thereby negating the potential impact of the “get tough” legislation.

(2) Impaired driving causing bodily harm or death

These are serious indictable offences. As shown, impaired driving causing bodily harm carries a maximum sentence of 10 years’ imprisonment and a 10 year driving prohibition, while the maximum for impaired driving causing death is 14 years’ imprisonment and a 10 year driving prohibition. However, many suspects initially charged with one of these offences appear to have the charge withdrawn in exchange for a guilty plea to impaired driving. It is reasonable to assume that the remaining cases involved the most blatant conduct and offenders with the most serious records. Given these factors and the seriousness of the offences, the high percentage of prison terms for impaired driving causing bodily harm (77.9%) and impaired driving causing death (91.3%) is not surprising.
Table 4  Federal drinking and driving offences and penalties, Canada, 1996–97*

<table>
<thead>
<tr>
<th>Offence</th>
<th>Minimum penalty</th>
<th>Maximum penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired driving BAL &gt;0.08%</td>
<td>First offence: $300 fine and three month driving prohibition</td>
<td></td>
</tr>
<tr>
<td>Failing to provide samples</td>
<td>Subsequent offence: 90 days imprisonment and one year driving prohibition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum penalty: Summary conviction: $2000 fine, six months’ imprisonment, and three year driving prohibition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indictment: †five years’ imprisonment and three year driving prohibition</td>
<td></td>
</tr>
<tr>
<td>Impaired death</td>
<td>14 years’ imprisonment and 10 year driving prohibition</td>
<td></td>
</tr>
<tr>
<td>Impaired/bodily harm</td>
<td>10 years’ imprisonment and 10 year driving prohibition</td>
<td></td>
</tr>
<tr>
<td>Driving while prohibited</td>
<td>Summary conviction: $2000 fine, six months’ imprisonment and three year driving prohibition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indictment: †two years’ imprisonment and three year driving prohibition</td>
<td></td>
</tr>
</tbody>
</table>

*The 1999 Criminal Code amendments increased the minimum and maximum penalties for impaired driving, driving with a BAL above 0.08%, and failing to provide samples, and the maximum penalty for driving while prohibited or suspended when tried by indictment.

†In addition to these penalties, the offender may be fined any amount the judge believes appropriate.

(3) Driving while prohibited

This hybrid offence carries a maximum penalty of six months’ imprisonment, a $2000 fine, and a three year driving prohibition if tried by summary conviction. If tried by indictment, it carries a maximum sentence of two years’ imprisonment and a three year driving prohibition. As table 3 indicates, 83% of those convicted of driving while prohibited are imprisoned. This imprisonment rate is higher than that for impaired driving causing bodily harm. However, those convicted of driving while prohibited would necessarily have at least one relatively recent previous conviction. As well, judges tend not to be lenient with offenders who fail to comply with their earlier sentences.

Discussion

The purpose of this study was to examine enforcement, prosecution, and sentencing in the federal drinking and driving cases tried in Ontario. Our research demonstrates how difficult it was to obtain what we thought, perhaps naively, was basic statistical information. Moreover, there were major gaps in the data. We could not find information on what happens before the police lay a criminal charge, nor what happens to these charges before the accused’s first court appearance. In addition, some of the data were difficult to assess because of the way they were presented. For example, the sentencing data would have been far more useful had information been provided on the offenders’ prior drinking and driving records.

Despite these limitations, the results highlight serious concerns about enforcement, prosecution, and sentencing practices. First, surprisingly few charges were laid for the most serious offences. Moreover, a large percentage of the charges that were laid for these offences were withdrawn, presumably in exchange for a guilty plea to a lesser charge. This is particularly troubling given that drinking and driving is, by far, the single largest criminal cause of death in Canada.23

There were also large percentages of stays and withdrawals in other offence categories. Although many of the stays and withdrawals were legally required by the Kienapple rule, a significant percentage appear to result from the exercise of prosecutorial discretion and negotiated pleas. Finally, a significant number of repeat offenders were sentenced as first offenders, presumably as a result of plea negotiations, prosecutorial discretion, and insufficient resources to prove the offender’s prior record.

Implications for prevention

The federal and provincial governments’ statements about their “get tough” legislation stand in sharp contrast to the picture revealed by the statistical analysis. The data suggest that what is needed is increased resources and staff, and legislation that will streamline police processing of suspects, reduce the technical and evidentiary obstacles to prosecuting cases, and simplify the task of proving an offender’s prior driving and driving record. Moreover, the analysis calls into question the likely effectiveness of legislation that merely increases sanctions.

1 An act to amend the Criminal Code (impaired driving and related matters), Statutes of Canada 1999, c 32, ss 5(1), and 3.
2 Statutes of Ontario 1997, c 12, s 1.
3 Motor Vehicle Act, Revised Statutes of British Columbia 1996, c 318, s 232(3).
10 Revised Statutes of Canada 1985, c Y-1.
12 R v Kienapple (1975), 15 Canadian Criminal Cases (2d) 524 (Supreme Court of Canada).
13 R v Houchen (1976), 31 Canadian Criminal Cases (2d) 274 (British Columbia Court of Appeal); and R v Boyuin (1976), 34 Canadian Criminal Cases (2d) 203 (Quebec Court of Appeal).
14 R v Schilbe (1976), 30 Canadian Criminal Cases (2d) 113. (Ontario Court of Appeal).
17 *R v Laroque* (1988), 5 Motor Vehicle Reports (2d) 221 (Ontario Court of Appeal).
21 Ontario Ministry of Transportation. *The number of drivers convicted or re-convicted of drinking and driving related Criminal Code offences within ten years—Ontario*. Provided to A Murie, Executive Director of MADD Canada, on November 27, 1999 in Toronto, Ontario.

**Editorial board member: brief biography**

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Dr R J Shephard is presently Professor Emeritus of Applied Physiology in the Faculty of Physical Education and Health and the Department of Public Health Sciences, Faculty of Medicine, University of Toronto. He was Director of the School of Physical and Health Education at the University of Toronto for 12 years (1979–91), and Director of the University of Toronto Graduate Programme in Exercise Sciences from 1964 to 1985.

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He holds four scientific and medical degrees from London University (BSc, MBBS, PhD, and MD) and honorary doctorates from Gent University (Belgium) and the Université de Montréal, together with the Honour Award of the Canadian Society of Exercise Physiology and a citation from the American College of Sports Medicine. He is a former president of the Canadian Association of Sports Sciences, a former president of the American College of Sports Medicine, editor-in-chief of the *Year-Book of Sports Medicine* and founding editor of the *Exercise Immunology Review*, a former editor in chief of the *Canadian Journal of Sport Sciences*, associate editor of the *International Journal of Sports Medicine*, and a member of the editorial board of many other journals.

He is the author of some 70 books on exercise physiology, biochemistry and immunology, and fitness in able bodied individuals and those with various types of disability, and he has published over 1400 scientific papers on related topics.