ICBC **Performance Analysis Services**

GRADUATED LICENSING: YEAR SIX EVALUATION REPORT

SHORT- AND LONGER-TERM EFFECTS ON NEW DRIVER CRASH RATES, SPECIFIC COMPONENT EFFECTS, AND EARLY EFFECTS OF OCTOBER 2003 ENHANCEMENTS (GLPe)

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EXECUTIVE SUMMARY

Background

It is well known that new drivers are at a higher risk of crash involvement than are experienced drivers. British Columbia (BC)'s Graduated Licensing Program (GLP) was implemented in three releases between August 1998 and December 2000. The program applies to new drivers of all ages and includes an extended Learner stage, a restricted Novice (or intermediate) stage, and an exit test for graduation to Full Privilege licensure. A comprehensive driver education curriculum was also developed and implemented in conjunction with GLP, and drivers who successfully complete an approved course may submit a Declaration of Completion (DOC) to ICBC and apply to have the GLP Learner stage reduced by up to 3 months (90 days).

An interim evaluation (year 3) of BC's GLP (Wiggins, 2004) found that it had successfully reduced the crash involvement rates of the new drivers who entered the program during its first year of operation. However, the evaluation also revealed potential weaknesses in the program: no evidence was found of a positive program effect once drivers reached the Novice stage of licensure, and the time incentive offered to those who completed an approved driver education course was identified as a possible concern. The beneficial effects of GLP were attributed primarily to the extension of the Learner stage.

Based on the findings of the interim evaluation and on the accumulation of evidence from other jurisdictions, several changes were implemented in October 2003 in an effort to enhance the program's effectiveness. These changes included: increasing the length of the Learner and Novice stages by 6 months, adding a passenger restriction to the Novice stage, and requiring that Novice drivers remain prohibition-free for a total of 24 consecutive months before becoming eligible to take their exit road test.

The enhanced GLP (GLPe) did not, however, include removal of the Learner stage time incentive offered to drivers who completed an approved driver education course. There were several reasons for this decision. Firstly, as noted above, the concerns that were emerging about the time incentive were based on findings from an early GLP cohort. Due to the staged release of the program none of these drivers had been exposed to a fully implemented version of GLP. Secondly, the approved driver education curriculum was still being implemented and was not widely available to the drivers included in the early evaluations. Like GLP, the approved driver education curriculum had continued to be developed and implemented throughout 1999 and 2000. Finally, it was unknown to what extent the 6-month extension of the Learner stage implemented with GLPe, in October 2003, might attenuate the effect observed with GLP.

Objectives

The evaluation had the following objectives:

1 To assess the magnitude and consistency of the effects of GLP on the short-term (one- and two-year) and longer-term (three- and four-year) crash involvement rates of GLP New drivers.

2 To assess the relative contributions of the GLP Learner and Novice stage restrictions and conditions to the overall effect.

3 To compare the short- and longer-term effects of GLP on crash rates for New drivers who entered GLP before (1999-2000) and after (2001-2002)[1] it was fully implemented,

4 To determine whether the higher crash rates previously reported (Wiggins, 2004) for Novice drivers who had completed an ICBC-approved driver education course and applied for early Novice licensure would be observed in subsequent cohorts of drivers and, in particular, among drivers who entered the system after GLP was fully implemented,

5 To explore the potential predictive value of the GLP knowledge and road tests (Class 7 and 5 only),

6 To investigate whether a 6-month extension of the Learner stage (as introduced with GLPe) might be sufficient to neutralize the negative impact on crash rates that has been observed (Wiggins, 2004; Mayhew et al., 2003; Boase and Tasca, 1999) when early Novice licensure is made available to drivers who complete an approved driver education course.

Method and Scope

This evaluation was conducted in three studies:

Study 1 was conducted primarily to provide historical context, to ensure that the results of the year 3 interim evaluation were not an artefact of the selected study groups, to examine the impact of the fully implemented program on New driver crash involvement rates, to assess the effect of the extended GLP Learner stage and its components on the crash involvement rates of Learner drivers, to explore the relative contributions of the Learner and Novice stage components in the overall effect of GLP on New driver crash rates, and to investigate the effect of completing an ICBC-approved driver education course on Learner driver crash rates.

Study 2 was conducted to examine the impact of GLP on the short- and longer-term crash involvement rates of drivers in the Novice stage of licensure, to explore the predictive validity of the GLP testing processes (knowledge and road) and associations between performance on the tests and crash involvement rates, and, finally, to examine relationships between completing and ICBC approved driver education course, early Novice licensure, and performance on the Class 7 knowledge and road tests.

Study 3 was a preliminary study designed primarily to explore the early impact of the extended Learner stage introduced with the October GLP enhancements (GLPe) on New driver and Novice driver crash rates.

All three studies were conducted using quasi-experimental prospective designs and data collected from secondary sources. The scope of the evaluation was limited to an assessment of crash impacts. Violations and other indicators of driver behaviour were not included.

[1] To maximize the comparability of risk within the GLP cohorts, drivers who had not obtained their first Learner (or Novice) licence in time to be able to accumulate a full three- or four-years of licensure by June 30, 2005 (the cut-off date for the evaluation) were excluded from the analyses of long-term crash involvement rates. This exclusion process affected the 2001 and 2002 GLP New driver cohorts and all of the Novice driver cohorts. Hence, the long-term results presented for these groups must be considered preliminary until more complete data is available for these groups.

Definitions

In this report, reference is made to three categories of drivers: New drivers, Learner drivers, and Novice drivers. In many jurisdictions the terms "New driver" and "Novice driver" are used interchangeably. Here, however, they are not. Instead, the term "Novice driver" refers only to the subset of drivers who have advanced from the Learner stage to their first solo (unsupervised) licence. The term "New driver" refers to drivers in the early stages of the licensing process but who may hold either a Learner or "Novice"[2] licence.

Key Findings

1. GLP has successfully reduced the short- and longer-term crash involvement rates of New drivers. Compared to Pre-GLP New drivers, the GLP 1-year crash rate declined from 17.8 to 13.1 per 100 licensed driver years , a reduction of 26%. The estimated magnitude of the impact of GLP declined as the length of licensure increased, but remained at about 12-13% when the first four years of licensure was assessed. The impact of the program was also reduced when the assessment was restricted to drivers who advanced to Novice licensure within each period of licensure. When restricted in this way, the estimated crash rate reductions were found to be about 14% for the first year of licensure, and about 9% for the first four years. No reduction in crash rates was observed for Experienced driver groups when compared over the same time periods as the New driver groups. It is likely, therefore, that the observed changes are attributable to the program. These results are consistent with the results reported in the year 3 interim report.

2. The age at which New drivers obtained their first Learner licence declined after implementation of GLP. This shift reduced the effectiveness of GLP by approximately 5-6 percentage points. For example, once age and gender were taken into account the percentage reduction for the first year of licensure increased from 26% to 32%; for the first four years of licensure it went from 12% to about 17-18% (depending upon the GLP cohort used in the analysis).

3. Consistent with the year 3 interim report, Novice drivers in GLP who completed an approved driver education course and submitted a DOC were estimated to have a 26% higher crash rate during their first year of Novice licensure than those who did not (year 3 evaluation estimate was also 26%). This effect was obtained after removing the influence of group differences in age and gender. The effect was reduced to 24% after GLP was fully implemented in 2000. An important factor confounding the results of these analyses was the time incentive offered to the drivers who completed the approved course. Drivers who spend less time in the Learner stage tend to have higher crash rates than those who spend more time in the Learner stage. Due to the time incentive, drivers who completed the approved course spent less time in the Learner stage than drivers in the comparison group. This confounding effect makes it difficult to evaluate the effectiveness of the approved course. It is clear that some if not all of the DOC effect is due to the shorter time these drivers spend in the Learner stage. However, until this confounding factor has been removed, the extent to which the higher crash rates of the DOC group are attributable to the course itself, to the time incentive, or to other factors. will remain unclear.

4. Inconsistent effects were detected with respect to the impact of GLP on all Novice driver crash rates. Some reductions in crash rates were observed for GLP compared to Pre-GLP drivers, but only in their third and fourth years of solo licensure. And the impact was not strong enough to counteract the higher crash rates observed for GLP Novices during their first two years of licensure. All of the possible reasons for the higher GLP Novice driver rates are not known. However, the early licensure

[2] Prior to GLP, new drivers advanced from the Learner stage to a Full Privilege licence. For the purposes of this evaluation Pre-GLP drivers who obtained their first Full Privilege licence during the study period are referred to as "Novice" drivers.

and higher crash involvement rates of drivers who completed an approved driver education course were identified as key factors. Compliance during the early years may also be an issue. An important factor identified as having a positive influence on the crash rates of Novice drivers was the extension of the GLP Learner stage. A longer Learner stage helps to minimize the differences between the GLP and Pre-GLP Novice driver crash rates. More research is needed in order to determine the optimal time for the Learner stage, but the results from the Novice driver study suggest that 12 months may be sufficient.

5. Drivers who submitted a DOC prior to taking their first road test were more likely to pass the test on their first attempt than a comparison group of drivers who did not submit a DOC. When performance on the test was taken into account in modelling crash involvement rates of Novice drivers the relative risk for DOC versus No DOC drivers declined from 1.14 to 1.08. The effect was not strong enough, however, to neutralize the impact of early Novice licensure.

6. Although GLP was introduced to BC in 1998, the original components of the program were not fully implemented until the end of 2000. Several documentation changes were made at that time and an enhanced knowledge and a new level 1 road test were introduced. Results from comparing the overall impact of the fully implemented program (GLP 2001-2002) versus the early years of GLP (GLP 1999-2000) were inconsistent. Some reductions in crash rates were observed following full implementation of the program, but most of the observed reductions in rates were small in magnitude and tended not to fall in the expected periods of licensure. The results were difficult to interpret but may have been due to the testing processes introduced at the end of 2000.

7. Little evidence was found to suggest that the knowledge test had predictive validity for crash involvement in the Learner stage. Nor was there strong evidence of an association between the Class 7 road test and Novice crash involvement, at least not during the early months of Novice licensure. Lower crash rates were observed for Novice drivers before and after taking the Class 5 road test. However, the lack of an appropriate comparison group made interpretation difficult. The ease with which drivers passed the tests was found to be associated with crash involvement rates; drivers who passed on the first or second attempt had lower rates than drivers who took three or more attempts.

8. In October 2003, GLP was enhanced in an effort to increase the program's effectiveness. Early findings associated with the enhanced program (GLPe) suggest that it is reducing the short-term New driver crash involvement rate. Based on a 1.5-year follow-up period (producing an average of 10 months of follow-up per driver), overall crash rates (after adjustment for age and gender) were found to be about 64% lower for GLPe compared to GLP New drivers. These results are very early and are weighted heavily by the fact that most of the GLPe drivers were in the Learner stage for the entire study period. More follow-up will be required before the impact of GLPe Novice driver restrictions on Novice driver crash rates can be reliably assessed.

9. During the first 90-days of Novice licensure, the relative risk of crash involvement for Novice drivers in GLPe who submitted a DOC compared to those who did not was found to be about half the relative risk observed for GLP Novice drivers (1.24 and 1.40, respectively). Thus, although the DOC effect was lower for GLPe Novice drivers, it was not negated. Despite the extension of the Learner stage in GLPe, permitting drivers who submit a DOC to leave the Learner stage early remains problematic.

Recommendations

1. Continue to monitor and evaluate the effectiveness of GLPe in reducing the crash involvement rates of New drivers, with particular emphasis on the impact of the Novice stage components.
2. Assess compliance with GLPe Novice restrictions, and continue to investigate new ways to effect crash reductions among drivers in the Novice stage of licensure.
3. Review and evaluate the approved driver education curriculum and determine to what extent standards for implementation and delivery have been achieved. Investigate alternative driver education models, including the potential benefits of adding an advanced component during the Novice stage.
4. Remove the learner time incentive offered to new drivers who complete an approved driver education course. This would best be done in a way that mitigates any unintended consequences, such as the dissolution of the approved course, without having a confounding influence on crash rates.
5. Review the role and content of the Class 5 exit test for New drivers.

1. Introduction and Background

It is well known that new drivers are at a higher risk of crash involvement than experienced drivers. Since the early 1970's, jurisdictions in North America and elsewhere have been trying to find ways to reduce this risk and reduce the frequency of new driver crashes (Waller, 2003). Graduated licensing is one of the strategies that emerged from these efforts. Graduated licensing is a process that "provides new drivers with the opportunity to gain driving experience under conditions that minimize the exposure to risk" (Simpson, 2003, p. 27).

The first jurisdiction to adopt a graduated licensing program was New Zealand. It introduced a three-stage licensing process that included an extended Learner stage, a new restricted or Novice stage (with both night driving and passenger restrictions and a blood alcohol limit of 0.03% throughout) and a Full Privilege stage. Evaluations of the program's impact on crashes were promising (Langley, et. al, 1996) and, in the years following the publication of the results, many jurisdictions began to develop and implement graduated licensing systems. Initially, the New Zealand program was applied only to 15-24 year old drivers. However, in 1999 it was extended to drivers of all ages – although different features applied to the younger and older drivers (Simpson, 2003).

In North America there has been a split between the United States (US) and Canada with respect to participation in graduated licensing. In the US, most of the jurisdictions that have implemented graduated licensing programs have restricted their application to young drivers, while all of the Canadian jurisdictions with graduated licensing programs have targeted new drivers, regardless of age. Ontario was the first province to introduce graduated licensing, followed shortly thereafter by Nova Scotia. Both provinces implemented their programs in 1994. BC's program (GLP) was implemented in 1998. Now most of the provinces, as well as the Yukon Territory, have or are in the process of implementing some form of graduated licensing.

Evaluations of graduated licensing programs have been undertaken by several jurisdictions in Canada, the United States and elsewhere. While the estimated magnitude of the effects have varied from jurisdiction to jurisdiction, and program to program, all but one of the evaluations conducted to date have reported reductions in the crash involvements of new drivers following implementation (Simpson, 2003), including a preliminary evaluation of BC's program (Wiggins, 2004). The one evaluation that did not was conducted in California (Masten & Hagge, 2004) and was based on a program that did not include a delay of licensure component. Delay of licensure has been shown repeatedly to be an important component of successful graduated licensing systems. Moreover, although no overall effect was detected, significant crash reductions were reported in association with the program's passenger and night-time driving restrictions.

British Columbia (BC)'s Graduated Licensing Program (GLP) was implemented in three releases between August 1998 and December 2000. As with other Canadian jurisdictions the program applies to new drivers of all ages and includes an extended Learner stage, a restricted Novice (or intermediate) stage, and an exit test for graduation to Full Privilege licensure. A comprehensive driver education curriculum was also developed and implemented in conjunction with GLP, and drivers who successfully complete an approved course can submit a Declaration of Completion (DOC) to ICBC and apply to have the GLP Learner stage reduced by up to 3 months (90 days).

Between 2000 and 2004, a series of preliminary evaluations of GLP were conducted. The Year 1 (Potentier and Wiggins, 2000) and Year 2 (Potentier and Wiggins, 2001) evaluations monitored and documented the implementation of the program, and provided very early assessments of the program's impact on new driver crashes. The Year 2 evaluation also provided a preliminary assessment of the approved driver education curriculum (Potentier and Zellinsky, 2000) that was developed and introduced in tandem with GLP. The more recently completed Year 3 Interim Evaluation (Wiggins, 2004) provided the first comprehensive assessment of the early impacts of GLP on new driver violations and crashes. It also investigated the effectiveness of the

approved driver education curriculum in reducing the Novice driver crash rate. The results provided evidence that GLP had achieved some success. The new driver crash rate was found to have been reduced by about 16% (over a maximum 3.4 year follow-up period). However, this success was attributed almost entirely to the GLP extended Learner stage. Neither the approved driver education course nor the Novice stage restrictions were found to have had a positive impact on drivers once they left the supervised Learner stage. Although all of the reasons for the poorer crash outcomes of the drivers who completed the approved driver education course are not yet fully understood, one important factor was that they spent less time in the low risk Learner stage than drivers who did not complete the course. Consequently, the year 3 evaluation report recommended that the time incentive be considered for removal. The results of the year 3 evaluation also suggested that more needed to be done to enhance the effectiveness of the Learner and Novice stage conditions and restrictions. As well, it suggested that additional work was required to evaluate the approved driver education curriculum and to determine the factors, other than the time incentive, that may have been contributing to the higher crash rates associated with it.

Although discussions concerning the approved driver education curriculum and, specifically, the role of the Learner stage time credit are ongoing, other recommended program enhancements were implemented in October 2003. These enhancements came about in response to the recommendations of the year 3 report, the recent occurrence of a number of high-profile new driver crashes in BC, and the results of research and evaluation studies in other jurisdictions. For ease of reference in the remainder of this report, this enhanced program will be referred to as GLPe. The original program will continue to be referred to as GLP.

The following program changes were made with the implementation of GLPe (October 6, 2003):

1) the minimum length of the Learner stage was increased by 6 months for all new drivers (although the 3-month time incentive was retained for drivers who completed an approved driver education course). Thus, the minimum Learner stage was increased to 9 months for drivers who submit a DOC and to 12 months for those who do not,

2) a passenger restriction was introduced into the Novice stage,

3) the Novice stage was increased from 18 months (total accumulated time) to 24 months (consecutive, prohibition-free time), and

4) drivers taking an approved driver education course are required to log 60 hours of practice time rather than the 30 hours required under GLP.

Due to the recency of the implementation of GLPe, and the length of time it will take drivers to progress through the new program, it will not be possible to fully evaluate the effectiveness of the enhanced program for a number of years. In the meantime, it is important to continue to investigate and monitor GLP impacts and to begin to document the implementation and early effects of the 2003 program enhancements. This will provide important information for decision-makers in the short-term and will lay the groundwork for subsequent evaluations.

One of the limitations of the previous GLP evaluations is that they were based on the experiences of only one cohort of drivers: those who entered the program during its first year of operation, between August 1, 1998 and July 31, 1999. Due to the staged implementation of GLP, these drivers were not exposed to any of the program components introduced in November and December, 2000. Consequently, one of the objectives of this evaluation will be to determine whether the addition of these later components impacted the overall effectiveness of GLP.

A second limitation of the Year 3 Evaluation was that it was based on a 3.4 year study period (from the start date of GLP). Due to the sequential nature of licensing (new drivers enter the system every day), this means that the drivers in the study were observed for different lengths of time. This variation in follow-up time was dealt with by using driver-time in the rate denominators. However, an assumption underlying the use of

person-time denominators in rate calculations is that the risk of the outcome being measured remains constant over the time period studied (Mausner & Bahn, 1974). In the case of new driver crashes this assumption has limited validity. The crash risk of new drivers is low and relatively constant during the Learner stage, but it increases substantially at the beginning of the Novice stage, and then gradually decreases as the new driver gains experience. Consequently, to check the impact of this changing risk on past rate comparisons, the impact of GLP will be reassessed using equal amounts of driver-time for all drivers in the study groups (for example, all Novice drivers with one or two years of licensure). Although such rates were included in the Year 3 evaluation, they were not highlighted at that time due to the relatively small percentage of drivers from the GLP cohort who had accumulated more than 1 year of time in the Novice stage.

The evaluation described in this report had several objectives. It was designed primarily to assess the short-term (1-2-year) and longer-term (3-4 year) effects of GLP on new driver crash rates, and to establish baseline measures for assessing the effects of October 2003 enhancements (GLPe). A second purpose was to determine whether there had been any incremental effects attributable to the full implementation of GLP (at the end of 2000), and to examine the effects and predictive value of the GLP knowledge and road tests with respect to the crash involvement rates of new drivers. It was also of interest to determine whether previously reported findings concerning the relationship between crash involvement rates and completion of an ICBC-approved driver education course would be upheld within the context of the fully implemented GLP, and to examine the early effects of GLPe on the crash rates of Novice drivers who had completed an approved course.

The results of the evaluation are reported in the following sections:

- Section 2 provides a description of the program including the enhancements introduced in 2003.

- Section 3 provides a general description of the evaluation and its scope.

- Section 4 describes the study undertaken to assess the short- and long-term effects of GLP on all New driver (Learner and Novice combined) and Learner only crash involvement rates. An effort is made to examine not only overall effects, but specific effects of the Learner stage components, including the enhanced knowledge test, Class 7 (or 8) road test, and completion of an ICBC-approved driver education course.

- Section 5 describes the study conducted to assess the short- and longer-term effects of GLP on Novice driver crash involvements, including an assessment of any incremental benefits from the fully implemented program, the effect and possible predictive value of GLP testing procedures, and the impact of the ICBC approved driver education course and early Novice licensure on GLP Novice crash involvement rates.

- Section 6 describes the study undertaken to assess the early impact of GLPe on New driver crash rates and to ascertain what, if any, effect was obtained by adding six months to the Learner stage. Of particular interest was the impact that the extension of the Learner stage might have had on the association between Novice driver crash rates and completion of an approved driver education course.

- Section 7 discusses the findings from the three studies, and concludes with recommendations for future consideration.

2. Program Description

2.1 Program Goal and Objectives

British Columbia introduced its graduated licensing program in August 1998. The primary goal of the program is to reduce the frequency of New driver crash involvements. It aims to achieve this goal by assisting drivers to develop better driving skills, by encouraging the development of safe driving attitudes, and by reducing the amount of risk to which drivers are exposed while they are learning to drive and while they are gaining the experience, maturity, and judgement they need to drive safely. The program consists of two stages (a Learner stage and a Novice stage), each of which has specific restrictions and requirements, and each of which is completed with the passing of a road test. Once the second (exit) road test has been passed, a Full Privilege licence can be obtained. BC's GLP targets all new passenger vehicle drivers and motor cycle riders, regardless of their age.

Due to the differences in licensing processes across jurisdictions, there is considerable variability in the definitions that are used to refer to licensing stages and drivers. In many jurisdictions drivers are not referred to as 'licensed' until they have passed a road test and have been issued a licence (intermediate or full privilege) that allows them to drive unsupervised. In other jurisdictions, 'licensed' drivers include those who hold a Learner's permit. In this evaluation, the following definitions apply:

Licensed driver – any driver who holds a valid BC driver's licence (Learner, Novice, or Full Privilege).

Learner licence – a Pre-GLP Class 5L (passenger vehicle) or 6L (motorcycle) licence, a GLP Class 7L (passenger vehicle) or Class 8L (motorcycle) licence.

Novice licence – a GLP or GLPe (Class 7/8) licence. This is the first solo (unsupervised) licence issued to GLP drivers.

Full Privilege licence – a (Class 5/6) licence. This is the first solo (unsupervised) licence issued to Pre-GLP drivers, and the first unrestricted (with respect to GLP restrictions) licence issued to GLP drivers.

New Pre-GLP, GLP, or GLPe driver – a driver who is in the first six years of licensure (from the issue date of their first Learner licence).

Learner driver – any New GLP, GLPe, or Pre-GLP driver who holds a Learner licence.

Novice driver – any New GLP or GLPe driver who has been issued their first Novice licence and any New Pre-GLP driver who has been issued their first Full Privilege licence. Both GLP and Pre-GLP drivers will be referred to as Novice drivers until they have accumulated four years of unsupervised licensure (on either a Novice or Full Privilege licence or both).

Solo Licence – any licence that permits a New driver to drive (at least some of the time) without supervision. As used in this document Pre-GLP Full Privilege, GLP Novice and Full Privilege, and GLPe Novice and Full Privilege licences are all considered solo licenses.

2.2 Program Description and Implementation Process

Prior to GLP, New drivers were required to remain in the Learner stage a minimum of thirty days and had to pass a 30 minute road test prior to receiving a Full Privilege two-year probationary licence. During this probationary period a New driver might be prohibited from driving after receiving three violation tickets.

With the introduction of GLP in August 1998, New drivers were required to remain in the Learner stage for a minimum of 6 months unless they completed an ICBC-approved driver education course. Drivers who completed

such a course were able to reduce the minimum Learner time by up to 3 months. New drivers were also required to complete an 18-month Novice stage, which they could enter after completing the minimum Learner time and passing their first road test. After the 18-month Novice stage, drivers were required to pass a second, more advanced road test (Class 5/6) in order to graduate to a Full Privilege licence. During both the Learner and Novice stages drivers could be prohibited from driving after receiving two violation tickets. They were also not permitted to drive with a Blood Alcohol Content (BAC) greater than zero.

When GLPe was implemented in October 2003, the Learner and Novice stages were both extended by six months, and a passenger restriction and prohibition-free requirement were added to the Novice stage.

The development and timing of the implementation of the specific components of GLP and GLPe was done in four phases as described below and depicted in Figure 1.

GLP Transition Phase

May 4 to July 31, 1998 was a transition phase. Anyone receiving a Learner licence during this period was required to spend a minimum of three months as a Learner. The earliest exam date for these drivers was August 1, 1998 and upon passing the Class 7 or 8 road test they received a GLP Novice licence rather than a Full Privilege licence.

August 1, 1998 – GLP Release 1

Implementation of GLP entry requirements for all New drivers took place during this release. GLP Learner and Novice restrictions were imposed, as were enhanced adjudication sanctions. In addition, driving schools began offering the newly developed curriculum for the ICBC-approved driver education. New drivers successfully completing an ICBC-approved GLP driver education course could apply to have their Learner stage reduced by three months.

A five-day training course for driver-training instructors wishing to teach GLP driver education was developed, and the first course was offered in July 1998. Driver-training instructors however, were not required to have completed the five-day course in order to teach an ICBC-approved GLP course until February 1, 1999.

A practice guide was published titled *Tuning Up, a manual for new drivers and their co-pilots*, and was included in the toolkits provided to GLP drivers when they received their Learner licences.

January 24, 2000 – GLP Release 2.1

Release 2.1 included the development and implementation of the advanced (Class 5/6) road test. All GLP drivers must pass this test to obtain a Full Privilege licence.

Fall, 2000 – GLP Release 2.2

This release brought about the publication of new safe driving guides for passenger vehicle drivers; *RoadSense for Drivers*, and motorcycle riders, and *RoadSense for Riders*, both available as of September 2000. The new guides are more detailed than the previous *Safe Driving* or *Safe Riding Guides* and provide a systematic "see-think-do" approach. The aim of the guides is to present drivers with common-sense strategies to deal with the various problems they are likely to encounter on the road and thereby produce a thinking driver.

Implementation of the enhanced Knowledge Tests (passenger vehicle and motorcycle), took place on October 16, 2000, reflecting the content and approach of the *RoadSense* guides. Decision-making, rather than rote memory is required in order to pass the new tests.

As of November 27, 2000, drivers from out-of-province with less than 18 months of driving experience were required to enter GLP. In addition, the new Class 5/6 road tests became the entry test for anyone applying for

a Class 5 passenger vehicle licence or a Class 6 motorcycle licence, not just GLP drivers. Enhanced Class 7 and 8 road tests were developed and implemented as the entry tests for Class 7 and Class 8 licences. In addition, there was an implementation of a revised motorcycle skills test.

The publishing and distribution of *Tuning Up for Riders* took place in December 2000.

With Release 2.2 all of the development work needed for GLP was completed and by December 2000 all components of the program had been implemented. Transition from project development to ongoing operational support, including driver examiner motorcycle road test training, was completed by June 2001.

October 6, 2003 – GLPe Implementation

The following program enhancements were introduced on October 6, 2003:

The Learner stage was extended. GLPe drivers are required to complete a minimum of 180 days more in the Learner stage than GLP drivers. Thus, GLPe drivers who complete an approved driver education course must complete a minimum of 270 days in the Learner stage, compared to a minimum of 90 days for GLP drivers; and GLPe drivers who do not complete an approved driver education course must complete a minimum of 360 days in the Learner stage, compared to 180 days for GLP drivers.

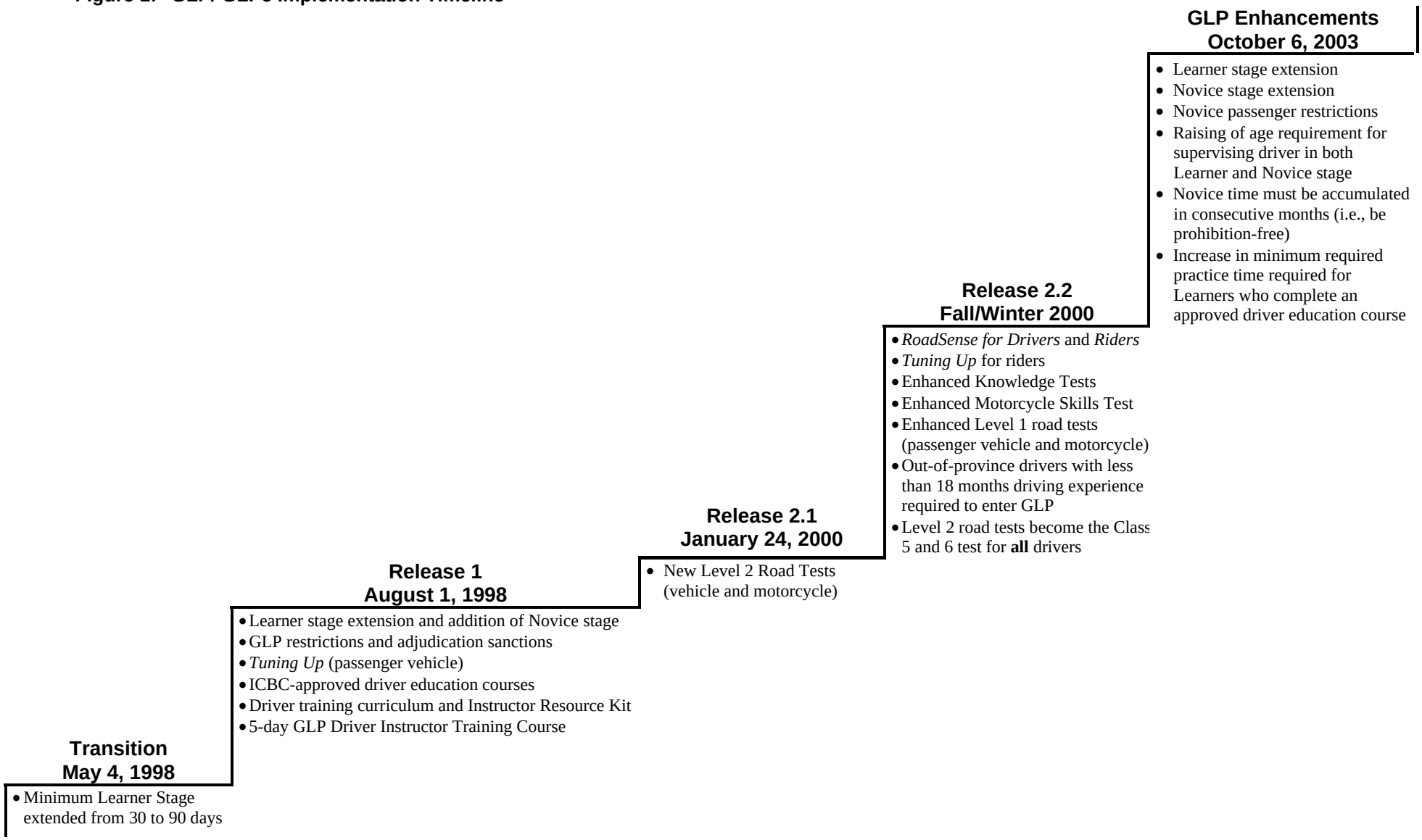
Additional practice time was added to the requirements for completion of an approved driver education course. GLPe drivers who complete an approved driver education course are required to log an 60 hours of practice time, compared to the 30 hours required of GLP drivers.

The Novice stage was extended and changed to continuous (prohibition-free) rather than total accumulated time. GLPe drivers are required to complete a minimum of 24 consecutive months in the Novice stage before applying to take the exit road test and attempting to graduate to a Full Privilege licence. GLP drivers were required to complete a minimum of 18 months in the Novice stage and there was no requirement that the time be accumulated consecutively.

While in the Novice stage, GLPe drivers are not permitted to carry multiple passengers. Under GLPe rules, Novice drivers may only carry one passenger unless there is a supervising adult in the vehicle. An exemption for immediate family members is provided. GLP Novice drivers did not have a passenger restriction.

The minimum age of a supervising adult was changed from l9 to 25 years. The minimum age requirement was applied to both the Learner and Novice stage of GLPe.

Figure 1: GLP/ GLPe Implementation Timeline



2.3 Status of the Implementation Process

GLP has been fully operational since December 2000. Program implementation was closely monitored until that time and a full description and assessment of the implementation process was provided in the Year 2 Interim Evaluation (Potentier and Wiggins, 2001). A preliminary, qualitative review of the implementation of the ICBC-approved driver education course was completed in 2000 (Potentier and Zellinsky, 2000). Although the licensing components of GLP were successfully implemented, some concerns were raised relative to the effectiveness of the implementation of the approved driver education course. In particular it was noted that there were inconsistencies in the extent to which schools were adhering to the curriculum. Since then, the ICBC Driver Training and Assessment Standards unit has continued to work with the Driver Training industry in an effort to improve the level and consistency with which the curriculum is taught. However, a subsequent evaluation of the implementation of the curriculum has not yet been undertaken. Currently, the future of the approved course, and of ICBC's role in its delivery and in the regulation of the driver training industry is under review. Consultations are ongoing and until the future of the course has been determined no further evaluations will be undertaken.

GLPe was implemented and became fully operational on October 6, 2003. As all of the steps needed to ensure the successful implementation of the enhancements had to be completed prior to the October launch date, no formal evaluation of the GLPe implementation process has been undertaken. A description of the implementation process and an assessment of the extent to which the new rules and restrictions are being applied, followed and enforced will be included in the first formal evaluation of GLPe (targeted for 2007).

2.4 Program Participation

Between August 1, 1998 and December 31, 2004, a total of 341,915 BC residents entered the GLP (or GLPe) Learner stage as first-time licence holders. A count of new Learners by intake year is shown in Table 1. The number of new Learners per month, in each period, is also shown

In 1996, 1997, and the early part of 1998 (before GLP), the number of drivers entering the licensing system for the first time was considerably higher than it was after GLP was implemented (Table 1). News of licensing changes in BC prompted a large increase in the number of people obtaining a Learner's licence in the months prior to the implementation of GLP (January to July 1998). A slight increase was observed in the months leading up to the implementation of GLPe (January to October 5, 2003) but it is not likely that this was related to the onset of GLPe. No advance notification had been provided prior to the GLPe implementation date.

Table 1: Learner Licences obtained by New Drivers*

Year	Licensing Program	Number	Number per Month
1996	Pre-GLP	60,174	5,014
1997	Pre-GLP	77,924	6,494
1998	Pre-GLP, GLP Transition, GLP	78,506	6,542
1999	GLP	52,204	4,350
2000	GLP	55,193	4,599
2001	GLP	50,808	4,234
2002	GLP	56,499	4,708
2003	GLP, GLPe	56,316	4,693
2004	GLPe	54,903	4,575

**Drivers who had never previously held a licence or Learner's permit (in BC or any other jurisdiction)*

3. Evaluation Overview

3.1 Purpose and Scope of the Evaluation

The evaluation described in this report is limited in scope. It is a transitional evaluation; designed primarily to document the short- and longer-term effects of GLP on New driver crash rates and to lay the foundation for future evaluations of the changes implemented with GLPe. It explores the effects and predictive value of the GLP knowledge and road tests and is designed to replicate and further investigate relationships between Novice driver crash rates, completion of an ICBC-approved driver education course, the provision of a Learner stage time incentive, and the early effects of the extended Learner stage introduced with GLPe. A more comprehensive evaluation of GLPe will be undertaken when more drivers have had sufficient time to progress through the enhanced program.

The primary objectives of the evaluation are:

1. To assess the magnitude and consistency of the effects of GLP on the short-term (one- and two-year) and longer-term (three- and four-year) crash involvement rates of GLP New drivers.

2. To assess the relative contributions of the GLP Learner and Novice stage restrictions and conditions to the overall effect.

3. To compare the short- and longer-term effects of GLP on crash rates for New drivers who entered GLP before (1999-2000) and after (2001-2002)[3] it was fully implemented,

4. To determine whether the higher crash rates previously reported (Wiggins, 2004) for Novice drivers who had completed an ICBC-approved driver education course and applied for early Novice licensure would be observed in subsequent cohorts of drivers and, in particular, among drivers who entered the system after GLP was fully implemented,

5. To explore the potential predictive value of the GLP knowledge and road tests (Class 7 and 5 only),

6. To investigate whether a 6-month extension of the learner stage (as introduced with GLPe) might be sufficient to neutralize the negative impact on crash rates that has been observed (Wiggins, 2004; Mayhew et al., 2003; Boase and Tasca, 1999) when early novice licensure is made available to drivers who complete an approved driver education course.

To meet these objectives, three studies were undertaken: Study 1 examines the impact of GLP on the crash involvement rates of all New Drivers and on drivers in the Learner stage of licensure, Study 2 evaluates the impact of GLP on the crash involvement rates of drivers in the Novice stage of licensure, and Study 3 explores the early effects of GLPe on the crash involvement rates of all New drivers and of Novice drivers who did or did not submit a DOC.

[3] To maximize the comparability of risk within the GLP cohorts, drivers who had not obtained their first Learner (or Novice) licence in time to be able to accumulate a full three- or four-years of licensure by June 30, 2005 (the cut-off date for the evaluation) were excluded from the analyses of long-term crash involvement rates. This exclusion process affected the 2001 and 2002 GLP New driver cohorts and all of the Novice driver cohorts. Hence, the long-term results presented for these groups must be considered preliminary until more complete data is available for these groups.

3.2 Important Terms and Definitions

A number of terms with meanings specific to the evaluation are used throughout the report. For ease of reference the definitions of these terms are provided below:

Years of Licensure – unless otherwise indicated whenever years of licensure are referred to in this document (e.g., first year of licensure, first two years of licensure) it means the amount of time that has passed since the driver obtained his or her first Learner licence. It does not necessarily mean that the individual was actively licensed for the entire period of time. For ease of reference in rate calculations these periods of time are referred to simply as 'driver-years'. Within each period (first year, first two years), actively licensed time is referred to as 'licensed driver-years'. Licensed driver-years exclude periods of time when the driver was unlicensed (due to a licence cancellation, expiration, surrender or, in some cases, because a driver had died).

Evaluation or Study Period – this is the time period used to examine the driving records of the drivers included in the study. For example, in the present study, GLP drivers' records were examined during their first year, first two years, first three years, and first four years of licensure (from the issue date of their first Learner license). They were also examined during their first year, first two years, first three years and first four years of Novice licensure (from the issue date of their first Novice license), and during the first six months after the issue date of their first Full Privilege licence.

Cohort – a cohort is a group of individuals defined by some common characteristic and who remain part of a group over an extended period of time. In this evaluation, the cohorts are defined by the licensing process (Pre-GLP, GLP, or Pre-GLP) experienced by the driver and by their year of entry into the process (1996, 1997, 1999, 2000, 2001, or 2002).

Study group – a group of individuals selected for inclusion into a study. For present purposes the study groups may be the cohorts described above, or they may be sub-groups defined within the cohorts (e.g., drivers who did or did not successfully complete an ICBC-approved driver education course).

Intake period – this is the period of time during which participants are accepted into a study. Unless otherwise indicated, the intake period used for this evaluation was the calendar year in which a driver's first Learners licence was obtained.

Validity period – this is the length of time for which a licence is issued. For Pre-GLP Learner drivers the validity period was 6 months, for GLP Learners it was initially 1 year but was increased to 2 years when GLPe was implemented. Pre-GLP drivers who passed their first road test were issued a 2-year probationary licence after which they could pay a renewal fee and obtain a 5-year Full Privilege licence; GLP drivers who passed their first road test were issued a 5-year Novice licence. At the end of each term, drivers must renew their licence in order for it to remain valid. Prior to GLPe there were no requirements for Learner drivers to retake their knowledge test prior to renewing their Learner licence. As well, motorcycle riders were not required to retake their motorcycle skills test (MST). This was changed with the implementation of GLPe and now both groups must be retested before renewal.

ICBC-approved driver education – based on the *Mapping a Safe Course* curriculum, this is a 32-hour course which consists of a minimum of 16 hours of in-class instruction, 12 hours of in-car instruction and 4 hours of discretionary time. Driver training schools must have their GLP course approved by ICBC before offering it to students. Driver-training instructors must complete a 5-day course in order to have a GLP designation on their instructor licence, and to teach an approved course. GLP drivers who complete this course must also log 30 hours of practice time (60 hours for GLPe driver) in order to obtain a Declaration of Completion.

Declaration of Completion (DOC) – a DOC is the certificate that students receive when they complete an approved driver education course. Upon submission of the DOC to an ICBC driver services centre students can have their Learner stage reduced by up to 3 months.

Confounders or Confounding Factors – confounding factors (confounders) are variables that contribute to results that are misleading. For example, age and crash involvement are known to be highly related. If the crash rates of populations from different geographic regions are to be compared, but one population is much younger than the other, the association between area and crash risk will be confounded by the association between age and crash risk. In order to provide a clearer picture of the association between area and crash risk, the differences in the age distributions of the two populations must be taken into account.

Cut-off Date – this is the date selected for ending all counting processes. For the purposes of this evaluation the selected cut-off date for the GLP cohorts was June 30, 2005. This provided a maximum timeline of six and a half years for the 1999 cohort, and a maximum of three and a half years for the 2002 cohort. For comparability with the 1999 group, the cut-off date for the 1996 Pre-GLP cohort was set to June 30, 2002, and for the 1997 cohort it was set to June 30, 2003.

3.3 Definition and Calculation of Crash Involvement Rates

In this evaluation there are three primary outcome variables of interest: New driver crash involvement rates, Learner crash involvement rates, and Novice crash involvement rates. The numerators for the short-term rates were obtained using crash involvement counts accumulated by each driver during their first year of licensure (from the first Learner and from the first Novice licence issue dates) and the first two years of licensure; longer-term rates were based on the first three and four years of licensure (again from the first Learner and first Novice issue dates). Crash involvement counts, not crash incidents, were used as the numerator in all rate calculations. Thus, the counts reflect all New driver-crashes, even when more than one New driver was involved in the same incident, or when one New driver was involved in more than one crash.

The denominators used in the crash involvement rates were calculated in two ways. First, they were calculated using simple driver counts multiplied by the number of years during which crashes were counted (i.e., 1, 2, 3, or 4 years). These are the types of denominators often used in other jurisdictions for rate calculations and are referred to simply as ***per driver-year*** rates. They are included in this report for descriptive purposes only. The rates of primary interest in this evaluation were calculated using licensed driver-time denominators. These are referred to as ***per licensed driver-year*** rates. A licensed driver-year includes all of the time in a given year when a driver held a valid BC licence. It excludes any periods of time when a driver's licence was suspended, cancelled, or expired. For most of the drivers, their licensed driver-time was counted from the issue date of their first licence (Learner or Novice) until the end of the particular period of interest (first year, second year, third year, or fourth year of licensure). For some drivers, however, it was necessary to assign an early termination date. These were drivers who, for the reasons cited below, did not hold a valid BC driver's license at the end of each targeted year of licensure. For these drivers, crashes and licensed-driver time were censored (i.e., counted to the early termination date rather than to the end of the full study period). The first of the following events was used to establish an early termination date.

- A license surrender date – a driver could have surrendered a licence for a number of reasons. Commonly, drivers surrender their license when they move to another jurisdiction. Due to the possibility of exposure to a different licensing system, surrender dates that preceded the study end date were used as early termination dates.

- A date of death – unfortunately some drivers died during the evaluation periods and consequently their study end date was amended to reflect their date of death.

- A licensing transition date – some drivers started their licensing process in one system but later transitioned into another (e.g., a Pre-GLP driver who subsequently obtained a GLP licence, a GLP driver who subsequently obtained a GLPe licence, or a Pre-GLP or GLP driver who subsequently obtained a commercial class licence). For these drivers their transition date was used as an early

termination date in order to ensure that calculated crash rates were relevant to the particular licensing program of interest.

- A license cancellation or expiration date – if the licence remained cancelled or expired and a new or renewal licence had not been issued by the end of the period of interest the termination date was amended to reflect the last day of valid licensure. With respect to expired licences, only those that were not renewed within 30 days of the expiration date were considered to be 'expired' for present purposes.

One further adjustment was made to the rate denominators for Pre-GLP drivers who never advanced beyond their first Learner licence. Prior to GLP, the validity term for a Learner licence was six months. At the end of that time the driver had to renew his or her licence or it would expire. When GLP was introduced the validity term was increased to one year in order to give GLP drivers time to take their first road test before having to renew their Learner licence. There were, however, drivers in both licensing programs that did not advance beyond their first licence. As a result of the change in validity term, GLP drivers in this group were credited with one year of driver-time while Pre-GLP drivers were only credited for six months. It is unlikely, however, that the drivers in the GLP group who let their first Learner licence expire at the end of it's first validity term were that much different from their counterparts in the Pre-GLP system in terms of their actual driving exposure. The majority of rate calculations and comparisons used in this evaluation were based on the drivers who did advance beyond the Learner stage and, therefore, these rates were not influenced by the change in validity term. However, for the few New driver rate calculations that included these drivers, the amount of driver-time credited to them was adjusted so that both the GLP and Pre-GLP drivers in this group were credited with one licensed driver-year.

3.4 Statistical Analysis

Crashes were analyzed in a series of steps. Basic summary statistics were computed (e.g., medians, counts, percentages, and rates) to describe driver and crash characteristics and relationships between these characteristics and study group membership were assessed using Chi-square tests of association. To compare crash involvement rates between the study groups, and to test for statistical significance, relative risks (e.g., the crash rate for GLP drivers divided by the crash rate for Pre-GLP drivers) were estimated and compared using Poisson regression (Kleinbaum, Kupper, and Muller, 1998) analysis. Poisson regression analysis is appropriate for data involving counts (e.g., number of crashes) and can take into account the varying lengths of follow-up time that each individual contributes to the rate denominator (i.e., licensed driver-years). Poisson regression also permits the inclusion of more than one predictor variable in the analysis model enabling adjustment for potential covariates or confounders such as age, gender, and amount of Learner time.

In analyses involving potential covariates or confounders, adjusted rates and relative risks were computed from the results of the Poisson regression models. The mean values of each of the independent variables included in the final models were used to calculate the adjusted rates. Likelihood ratio-based 95% Confidence intervals were computed for the relative risks, and approximate 95% Confidence intervals were computed for both the crude and adjusted rates (Public Health Network, 2003). When necessary, Likelihood Ratio Chi Square statistics were used to test for the statistical significance of linear contrasts. These contrasts were used to test for differences between pairs of groups when more than two groups were included in the regression model. All of the analyses were conducted using SAS Version 8 (1999) statistical software.

Determination of statistical significance was based on the following criteria: $P<0.0001$ = statistically significant; $P>0.0001$ and $P<0.005$ = moderately significant; $P>0.005$ and $P<0.05$ = marginally significant; $P>0.05$ = not significant. These criteria are fairly stringent but were selected due to the number of analyses conducted (which increases the probability of spurious findings) and the use of large sample sizes (which increases the likelihood of detecting very small differences that may be of little practical significance).

3.5 Data Sources

Five automated data systems from the Insurance Corporation of British Columbia (ICBC) were used to construct the study databases used in the evaluation. The Driver Licensing System (DLS) was used: to identify drivers for inclusion in the study, in specifying the variables to use in describing the characteristics of the New driver cohorts, and to identify driving prohibitions and suspensions. The Driver Training School System (DTSS) was used to identify drivers who submitted a Declaration of Completion (DOC). The Traffic Accident System (TAS) and the ICBC Business Information Warehouse Claims (BIWC) were used to identify crashes in which the New drivers had been involved, as well as the benefits paid out for their crash claims. The crash data identified from these two sources were each analyzed separately.

Driver Licensing System (DLS)

The Driver Licensing System is a relational database that stores information on every driver licensed in the province of British Columbia. It includes information on licences issued, the status of drivers' licences (e.g., normal, suspended, on hold, etc.), as well as information on any tests taken, the types of licences issued, and the nature and time-lines of any driving prohibitions or licence suspensions. The driver-related variables extracted from the DLS for use in the present study included the following driver information: birth date, gender, licence number, date of obtaining a first Learner licence, and the date of passing a first road test. Additional extracted information included, in the case of the Pre-GLP group or an Novice driver, for the GLP cohort, the date of becoming Full Privilege driver. Driving prohibition or suspension data extracted included: suspension cause, start date, and reinstatement date.

Driver Training School System (DTSS)

This system includes driving school data and DOC data. DOC's are submitted by drivers who successfully complete an ICBC-approved driver education course. The name of the driving school and the date of DOC submission are included in the system.

Business Information Warehouse - Traffic Accident System (TAS)

TAS contains police-reported crash data. Motor vehicle collisions are reportable in British Columbia if they result in: personal injury or death, or aggregate property damage in excess of $1,000 ($600 in the case of a motorcycle). However, crashes involving property damage only are determined to be reportable based primarily on police estimates of the amount of damage, which may not be accurate. Moreover, in 1996, many police agencies changed their standards or practices for collision reporting. This has resulted in fewer reported collisions, particularly those involving only property damage or minor injuries. Consequently, the number of New driver collisions reported from TAS will likely underestimate the actual number of crashes experienced by drivers. TAS is however, the primary data source for information concerning fatal crashes.

Business Information Warehouse – Claims (BIWC)

Due to the under-reporting of non-fatal crashes in TAS, claims crash incident data was extracted from the BIWC. This data provided a primary source for identifying New driver crashes, particularly those not involving a fatality. These incidents have been compiled from insurance claims reports. Consequently, although more crashes, specifically more minor crashes, are reported as a claim than those reported by police, the self-reported data might not be as reliable. The claimant might not accurately remember all the details of the crash or, the claimant may even alter details somewhat in order to present their case in a more favourable

light. In addition, some details of the crash reported in TAS (such as the number and age of passengers in the vehicle and if alcohol was involved) are not captured in the claims reports.

Unfortunately, although more crashes are reported in BIWC than in TAS, it still does not provide a complete census of crashes. Individuals involved in crashes may elect not to report a claim, in order to avoid an increase in insurance premiums or other potential repercussions. Consequently, and because more detailed information is available from TAS, both data sources were used in analysis of the crashes. This provides a more complete picture of the total crash experience of New drivers than would be possible if utilizing only one source.

The BIWC data were used to identify which drivers were determined to be responsible for their crashes. In multiple vehicle crashes, 100% responsibility is assigned: when it is clear that one of the drivers failed to comply with a section of the Motor Vehicle Act, and there is no evidence that there was contributory negligence by the other driver(s). In cases where there is evidence that more than one driver was negligent, the division of responsibility may be determined by reference to case law for similar fact crashes. In single vehicle crashes, responsibility is almost always assigned to the driver. For the purposes of the present study, drivers assigned 50% or more responsibility for a crash were categorized as “liable”.

All of the crash data (BIWC and TAS) used in the evaluation were extracted from the Business Information Warehouse on October 11, 2005. This extraction date provided a minimum lag-time of three months for the reporting of crashes. Although the vast majority of crashes are reported within the first few months of their occurrence, some are not. Consequently, crash counts obtained for time periods that included 2003 through 2005 may not be complete.

4. Study 1 - GLP Impact on New Driver Crash Rates

The study described in this section was designed to address the following evaluation objectives:

1 Estimate the magnitude and consistency of the GLP effect on the short-term (one- and two-year) and longer-term (three- and four-year) crash involvement rates of GLP New drivers.

2 Determine whether the full implementation of the program (Release 2.2 at the end of the year 2000, see Figure 1) had an incremental effect on the GLP New driver crash rate.

3 Assess the impact and relative contributions of the GLP Learner and Novice effects to the overall short- and longer-term New driver crash rates,

4 Evaluate the overall impact of the GLP Learner stage components, including the enhanced knowledge and Class 7 (or 8) road tests, on Learner crash involvement rates and explore whether performance on these tests may be related to Learner driver crash involvement.

5 Explore relationships between completion of an ICBC-approved driver education course, Learner driver crash involvement rates, and performance on the Class 7 road test.

4.1 Methods

4.1.1 Design

A quasi-experimental prospective study design was used to evaluate the effectiveness of GLP in reducing New driver crash rates. A quasi-experimental design attempts to test and estimate the effect of a program, or other intervention, when the investigator does not have complete control over all factors that may threaten the validity of the study. Instead, the investigator attempts to control, either by the design of the study or through statistical adjustment, as many potentially confounding factors as possible.

Due to the province-wide implementation of GLP, it was not possible to conduct the study using a true experimental design (in which the treatment is applied to a randomly selected group of New drivers and withheld from a concurrent group of randomly selected New drivers). Instead, all New drivers exposed to GLP were included in the treatment groups and all New drivers who entered the BC licensing system prior to GLP were included in the non-treatment group. Although historical comparison groups are useful in controlling for some potentially confounding variables, they do not provide any control for factors such as changes in road safety initiatives (unrelated to GLP), enforcement, or other social or economic factors that, in addition to GLP, could be influencing crash rates over the time period studied. Therefore, to take into account the potentially confounding effects of such non-GLP factors, the crash rates of experienced driver groups (who were not exposed to GLP) were computed and compared for the same time periods before and after the implementation of GLP.

4.1.2 Sample Selection Criteria

The drivers initially selected for inclusion in the evaluation were BC residents who had obtained their very first Learner licence between January 1, 1996 and December 31, 2002 (Table 1). Individuals who held an out-of-province licence prior to obtaining their first Learner licence in BC were excluded.

From this group six study cohorts were formed: two Pre-GLP groups (with intake periods in 1996 and 1997) and four GLP groups (with intake periods in 1999, 2000, 2001, and 2002). All of these cohorts were selected using a January to December intake period to ensure comparability and to avoid the potentially confounding effects of seasonal variations in crash rates. Drivers who entered the licensing system in 1998 were excluded

due to the implementation of GLP part way through the year. Drivers were aggregated into three groups according to the specific program components to which they were exposed (Pre-GLP 1996 and 1997, Early GLP 1999 and 2000, Full-GLP 2001 and 2002).

The specific inclusion and exclusion criteria used to identify the sample cohorts are given below:

New GLP Drivers

All BC drivers who obtained their first Learner licence between January 1, 1999 and December 31, 2002 (See Table 1)

From this group the following drivers were excluded:

- Drivers who were identified as having held an out-of-province licence at any point after their entry into GLP;
- Drivers who did not meet the minimum time requirements for completion of the GLP Learner and / or Novice stages;

New Pre-GLP Drivers

All BC drivers who obtained their first Learner licence between January 1, 1996 and December 31, 1997 (See Table 1).

From this group the following drivers were excluded:

- Drivers who were identified as having held an out-of-province licence either at any time after their entry into the BC licensing system;
- Any driver who did not meet the minimum time requirement for completion of the Pre-GLP Learner stage;
- Any driver who received a commercial vehicle licence (class 1 to 4) as their first licence;

In addition to the GLP and Pre-GLP samples included in the study, time-matched groups of experienced drivers were selected. The experienced driver groups were used to assess general trends in crash rates during the periods of time used in the evaluation of GLP drivers. The criteria used in the selection of the experienced drivers were:

Experienced Drivers

All BC drivers who were between 25 and 54 years of age on their birth date in each of the Pre-GLP and GLP intake years (1996, 1997, 1999 through 2002) and who, by that birth date, had accumulated at least 4 years (1440 days) of licensure (on a Class 5 or 6 licence).

Drivers with out-of-province driving experience and drivers who obtained a commercial vehicle licence (Class 1 to 4) during the years of interest were excluded from the experienced driver groups.

4.2 Results

4.2.1 New Driver Characteristics

A total of 352,802 drivers from the six annual cohorts were included in the evaluation of the short- and longer-term effects of GLP on New driver crash rates. Of these, 138,098 (39.1%) entered the licensing process prior to GLP (the Pre-GLP group), 107,397 (30.4%) entered during the early years (1999-2000) of GLP (the Early GLP group), and 107,307 (30.4%) entered the program in 2001 and 2002, after Release 2.2 (the Full GLP group). The age and gender distributions for each of the New driver cohorts are described below.

Table 2: Age Distribution at First Learner Licence by Licensing Year and Program

Age (in years)	Pre-GLP						Early GLP						Full GLP					
	1996		1997		1996-1997		1999		2000		1999-2000		2001		2002		2001-2002	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
16	28,515	47.4	38,530	49.5	67,045	48.5	34,823	66.7	35,204	63.8	70,027	65.2	32,745	64.5	34,160	60.5	66.905	62.3
17	5,001	8.3	7,364	9.5	12,365	9.0	4,057	7.8	5,780	10.5	9,837	9.2	4,847	9.5	6,480	11.5	11,327	10.6
18	3,022	5.0	4,205	5.4	7,227	5.2	2,094	4.0	2,629	4.8	4,723	4.4	2,750	5.4	3,589	6.4	6,339	5.9
19-21	5,025	8.4	5,942	7.6	10,967	7.9	3,356	6.4	3,584	6.5	6,940	6.5	3,346	6.6	4,701	8.3	8,047	7.5
22-24	3,040	5.1	3,410	4.4	6,450	4.7	1,626	3.1	1,647	3.0	3,273	3.0	1,617	3.2	1,818	3.2	3,435	3.2
>= 25	15,571	25.9	18,473	23.7	34,044	24.7	6,248	12.0	6,349	11.5	12,597	11.7	5,503	10.8	5,751	10.2	11,254	10.5
Total	60,174	100.0	77,924	100.0	138,098	100.0	52,204	100.0	55,193	100.0	107,397	100.0	50,808	100.0	56,499	100.0	107,307	100.0

Age by Year: Chi-Square = 14,900.1; df = 25; P<0.0001 Age by Program: Chi Square= 14,036.2; df = 10; P<0.0001

Table 3: Gender Distribution at First Learner Licence by Licensing Year and Program

Gender	Pre-GLP						Early GLP						Full GLP					
	1996		1997		1996-1997		1999		2000		1999-2000		2001		2002		2001-2002	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Male	28,760	48.8	36,919	47.4	65,679	47.6	25,613	49.1	26,825	48.6	52,438	48.8	25,365	49.9	27,376	48.5	52,741	49.2
Female	31,410	52.2	41,001	52.6	72,411	52.4	26,586	50.9	28,366	51.4	54,952	51.2	25,439	50.1	29,121	51.5	54,560	50.8
N/A*	4	0.0	4	0.0	8	0.0	5	0.0	2	0.0	7	0.0	4	0.0	2	0.0	6	0.0
Total	60,174	100.0	77,924	100.0	138,098	100.0	52,204	100.0	55,193	100.0	107,397	100.0	50,808	100.0	56,499	100.0	107,307	100.0

** N/A = Not available. Gender by Year Chi-Square = 98.8, df = 5, P<0.0001 Gender by Program Chi Square = 70.9; df=2; P<0.0001 (missing cases excluded from both analyses)*

Age and Gender at First Learner's Licence. With the implementation of GLP, there was a shift in the age distribution of the New driver groups (Table 2). A higher percentage of New drivers entered GLP at 16 and 17 years of age than prior to GLP (about 73% versus 60%), and a lower percentage of GLP (11%) than Pre-GLP (25%) drivers were over 24 years when they obtained their first Learner's licence ($P<0.0001$). As noted previously, in 1997 and the early part of 1998, a number of age-eligible New drivers chose to obtain their first Learner's licence prior to the introduction of GLP. The program's implementation dates had been advertised in advance. Therefore, age-eligible drivers were able to avoid GLP's more restrictive conditions by obtaining their permit before implementation began. This action likely explains some of the shift in the distribution, particularly in the early program years (1999-2000). Many of the older drivers who might otherwise have been in GLP had become Pre-GLP Learners. It is also possible, however, that GLP prompted more people to enter the licensing process at a younger age. The lengthy time requirement for completing GLP may be an important factor contributing to this trend, and finding that the percentage of young New drivers has remained high in 2001 and 2002 suggests that, although there may have been some transitional impact of program implementation on the pool of age-eligible drivers in the early years, younger licensure has become a fairly stable, albeit unintended, consequence of GLP. It will be interesting to see if this trend continues after the introduction (in 2003) of the even longer GLPe Learner stage.

In contrast to the findings with respect to age, no major differences were found between the cohorts with respect to gender. Approximately 51% of the New drivers in all of the study groups were female (Table 3).

Stages of Licensure. Table 4 shows the frequency and timing with which drivers in each of the cohorts progressed through the first stage of their licensing process – from a Learner licence to their first solo licence. As expected, given the longer learner stage of GLP drivers, a much higher percentage of the Pre-GLP (about 78%) than GLP (about 66%) drivers obtained their first solo licence within one year after obtaining their Learner's licence. The percentage remained higher, although less dramatically so, through the second year of licensure. By the end of the second year, approximately 86% of the Pre-GLP drivers and 80% of the GLP drivers had graduated out of the Learner stage. By the end of their third year, the percentages of Pre-GLP and GLP drivers who had advanced to a solo licence had become even more similar, although the percentage of Learner-stage graduates still remained slightly elevated for the Pre-GLP groups (about 89% and 86%, respectively). One exception occurred with the GLP 2002 cohort; only 82% of this group had graduated to their Novice licence by the end of their third year of licensure. However, less than half of this cohort had completed a full 3 years of licensure and none had completed four years when the count was taken. Consequently, the tabled percentages for these drivers are likely to increase when more follow-up data has been obtained. Nonetheless, it is clear that most New drivers – whether GLP or Pre-GLP – obtain their first solo licence within three years after obtaining their first Learner licence. Of the 10-15% of drivers who had not progressed by the end of their fourth year, most had allowed their Learner licence to expire without renewal (Table 5) while another substantial group still held a Learner licence. Detailed examination of the records of these drivers revealed that most of these drivers had long periods of time where their Learner licence was expired, and then renewed at a later date. Due to the time lag involved, the renewal of these Learner licences resulted in the drivers transitioning into a different licensing process. This affected all of the Pre-GLP drivers who still held a Learner licence after four years and some (1,143) of the GLP drivers.

Table 4: Timing of Advancement to a First Solo Licence for Pre-GLP and GLP Learner Drivers

First Solo (Novice) Licence Obtained During:	Pre-GLP				Early GLP				Full GLP			
	1996		1997		1999		2000		2001		2002	
	N	%	N	%	N	%	N	%	N	%	N	%
1st Year After Learner's	45,985	76.4	62,867	80.7	36,068	69.1	33,356	62.7	33,735	66.4	36,449	64.5
2nd Year After Learner's	5,605	9.3	4,938	6.3	6,027	11.6	9,443	17.8	7,573	14.9	8,096	14.3
3rd Year After Learner's	1,680	2.8	1,410	1.8	2,393	4.6	3,007	5.5	2,319	4.6	2,029*	3.6
4th Year After Learner's	625	1.0	715	0.9	1,169	2.2	1,446	2.6	775*	1.5	114*	0.2
Total by end of 4th Year:	53,895	89.6	69,932	89.7	45,657	87.5	47,252	85.6	44,402*	87.4	46,688*	82.6
No Original (Novice) licence Issued by the End of 4th Year	6,279	10.4	7,992	10.3	6,547	12.5	7,941	14.4	6,406*	12.6	9,811*	17.4
Number of Drivers in Cohort	60,174	100.0	77,924	100.0	52,204	100.0	55,193	100.0	50,808	100.0	56,499	100.0

* *These counts are incomplete. Only 27,671 (54.5%) of the 2001 cohort had obtained their first Learner licence soon enough to accumulate four full years of licensure by the evaluation cut-off date (June 30, 2005); only 30,588 (54.1%) of the drivers in the 2002 cohort were able to accumulate three full years, and none had accumulated four full years..*

Table 5: Licence Status of Drivers who were Not Issued their First Solo Licence within Four Years after Obtaining their First Learner Licence

Licence Status	Pre-GLP				Early GLP				Full GLP			
	1996		1997		1999		2000		2001		2002	
	N	%	N	%	N	%	N	%	N	%	N	%
Learner Surrendered	49	0.8	38	0.5	169	2.6	206	2.6	172	2.7	172	1.8
Learner Cancelled (Driver Died)	8	0.1	5	0.1	19	0.3	19	0.2	17	0.3	16	0.2
Learner Cancelled with no Reinstatement prior to end of 4th year	0	0.0	5	0.1	179	2.7	242	3.0	90	1.4	0	0.0
Learner Expired with no Renewal prior to end of 4th year	4,911	78.2	5,337	66.8	3,732	57.0	5,309	66.9	2,482	38.7	0	0.0
Learner still held*	1,311	20.9	2,607	32.6	2,448	37.4	2,165	27.3	647	10.1	0	0.0
Follow-up Incomplete – 4-year status not yet known	0	0	0	0	0	0	0	0	2,998	46.8	9,623	98.0
Total count of drivers who had not obtained a Novice Licence within 4 Years After Learner	6,279	100.0	7,992	100.0	6,547	100.0	7,941	100.0	6,406	100.0	9,811	100.0

**All of the Pre-GLP drivers who still held a Learner licence after four years had transitioned into GLP and 1,145 of the GLP drivers (3 from 1999, 498 from 2000, and 644 from 2001) had transitioned into GLPe.*

To exit the Novice stage and obtain a Full Privilege licence, GLP drivers had to remain in the Novice stage for a minimum of 18 months and then pass an advanced road test. Only 62,034 (28.9%) of the 214,704 GLP New drivers graduated to a Full Privilege licence within four years after obtaining their first Learner licence. Interestingly, the data shown in Table 6 suggest that drivers in the 2001 and 2002 GLP cohorts were starting to graduate out of the program sooner than those in the 1999 and 2000 cohorts. This may be a response to the implementation of GLPe in 2003. It should be noted, however, that only about half of the 2001 cohort had completed their fourth year of licensure and only about half of the 2002 cohort had completed their third year of licensure at the time of the study, and none of the 2002 cohort had completed a full four years. Thus, the percentages computed for these drivers may change as more follow-up data becomes available. Any conclusions concerning the potential impact of GLPe on the progression decisions of GLP drivers must, therefore, be considered preliminary.

Table 6: Timing of Advancement to a Full Privilege licence for GLP Drivers

First Full Privilege Licence Obtained During:	Early GLP				Full GLP			
	1999		2000		2001		2002	
	N	%	N	%	N	%	N	%
1st Year After Learner's	-	-	-	-	-	-	-	-
2nd Year After Learner's	773	1.5	1,077	2.0	1,744	3.4	2,402	4.3
3rd Year After Learner's	7,715	14.8	9,135	17.2	11,284	22.2	4,759*	8.4
4th Year After Learner's	5,903	11.3	7,567	14.2	4,648*	9.1	5,027*	8.9
Total by end of 4th Year:	14,391	27.6	17,779	33.4	17,676*	34.8	12,188*	21.6
No Full Privilege licence Issued by the End of 4th Year	37,813	72.4	37,414	67.8	33,132*	65.2	44,311*	78.4
Number of Drivers in Cohort	52,204	100.0	55,193	100.0	50,808	100.0	56,499	100.0

* *These counts are incomplete. Only 27,671 (54.5%) of the 2001 cohort had obtained their first Learner licence soon enough to accumulate four full years of licensure by the evaluation cut-off date (June 30, 2005); only 30,588 (54.1%) of the drivers in the 2002 cohort were able to accumulate three full years, and none had accumulated four.*

Table 7 shows the average amount and percentage of time spent by GLP and Pre-GLP drivers in each of their licence stages and within each total period of licensure. Only those drivers who entered the study early enough to accumulate each period of licensure were included in the data summarized in Table 7. As expected, the amount of time spent in the Learner stage by GLP drivers was considerably longer than the time spent in that stage by Pre-GLP drivers. During their first year of licensure, GLP drivers spent approximately 72% of their time in the Learner stage compared to only 47% for Pre-GLP drivers; and, although the percentage of Learner-time decreased for all groups as the total period of licensure increased, the percentage of Learner-time remained higher for the GLP groups throughout.

Of the drivers who were able to accumulate three or four full years of licensure by the study cut-off date, those in the GLP 2001 and 2002 cohorts spent a higher percentage of their total licensed driver-time in the Full Privilege stage than those in the GLP 1999 or 2000 cohorts. This is consistent with the earlier finding (Table 6) that the 2001 and 2002 drivers appeared to be graduating out of GLP sooner than the earlier GLP groups.

Table 7: The First Four Years of Licensure: Time Spent in Each Licence Stage by New Driver Cohorts

New Driver Cohort		Years of Licensure (from first Learner): One Year	Two Years	Three Years	Four Years
Pre-GLP 1996 (N=60,174)	Median Learner Months	4.4	4.4	4.4	4.4
	Median Novice Months	7.6	19.4	31.6	42.5
	Learner Licensed-Years (% of Total)*	27,687.5 (47.2)	28,287.4 (26.4)	28,580.5 (18.4)	28,583.7 (14.1)
	Full Privilege Licensed-Years (% of Total)	30,942.4 (52.8)	78,931.6 (73.6)	126,784.1 (81.6)	173,558.0 (85.9)
	Total Licensed-Years*	58,629.9	107,219.0	155,364.6	202,141.7
Pre-GLP 1997 (N=77,924)	Median Learner Months	4.5	4.5	4.5	4.5
	Median Novice Months	7.5	19.3	31.5	42.5
	Learner Licensed-Years (% of Total) *	35,464.0 (46.6)	35,975.1 (25.8)	35,979.1 (18.1)	35,980.2 (14.0)
	Full Privilege Licensed-Years (% of Total)	40,649.4 (53.4)	103,494.9 (74.2)	162,660.2 (81.9)	220,390.6 (86.0)
	Total Licensed-Years*	76,113.4	139,470.0	198,639.3	256,370.8
GLP 1999 (N=52,204)	Median Learner Months	8.0	8.0	8.0	8.0
	Median Novice Months	4.0	15.5	25.9	31.8
	Median Full Privilege Months	not applicable	0.0	0.0	0.0
	Learner Licensed-Years (% of Total)	36,496.2 (70.3)	43,489.3 (44.5)	47,705.2 (33.4)	50,470.5 (26.9)
	Novice Licensed-Years (% of Total)	15,418.8 (29.7)	54,238.7 (55.4)	90,650.7 (63.4)	121,173.1 (64.6)
	Full Privilege-Licensed-Years (% of Total)	not applicable	88.6 (0.1)	4,683.5 (3.3)	15,837.9 (8.5)
	Total Licensed-Years	51,915.0	97,816.6	143,039.4	187,481.5
GLP 2000 (N=55,193)	Median Learner Months	9.3	9.3	9.4	9.3
	Median Novice Months	2.5	14.1	23.9	28.0
	Median Full Privilege Months	not applicable	0.0	0.0	0.0
	Learner Licensed-Years (% of Total)	40,714.2 (74.2)	50,671.8 (49.2)	56,004.3 (37.1)	58,911.6 (30.0)
	Novice Licensed-Years (% of Total)	14,185.7 (25.8)	52,323.6 (50.7)	89,061.6 (59.1)	117,700.7 (60.0)
	Full Privilege-Licensed-Years (% of Total)	not applicable	135.9 (0.1)	5,726.9 (3.8)	19,537.2 (10.0)
	Total Licensed-Years	54,899.9	103,131.2	150,792.8	196,149.5
GLP 2001 Year1–Year3: (N=50,808) Year 4: (N=27,671)**	Median Learner Months	8.4	8.4	8.5	8.4
	Median Novice Months	3.5	15.1	23.9	26.5
	Median Full Privilege Months	not applicable	0.0	0.0	0.0
	Learner Licensed-Years (% of Total)	35,974.8 (71.2)	43,602.0 (45.5)	46,852.1 (33.8)	25,797.6 (26.6)
	Novice Licensed-Years (% of Total)	14,579.9 (28.8)	51,959.3 (54.3)	83,6834.0 (60.4)	58,313.2 (60.0)
	Full Privilege-Licensed-Years (% of Total)	not applicable	213.2 (0.2)	7,998.3 (5.8)	13,061.7 (13.4)
	Total Licensed-Years	50,554.7	95,774.6	138,534.4	97,172.5
GLP 2002 Year1–Year2: (N=56,499) Year 3: (N=30,588) Year 4: (N=0)****	Median Learner Months	8.7	8.6	8.6	Not available
	Median Novice Months	3.2	14.7	23.4	
	Median Full Privilege Months	not applicable	0.0	0.0	
	Learner Licensed-Years (% of Total)	40,453.7 (72.1)	47,313.2 (47.2)	26,862.9 (34.5)	
	Novice Licensed-Years (% of Total)	15,676.7 (27.9)	52,652.9 (52.5)	46,087.4 (59.2)	
	Full Privilege-Licensed-Years (% of Total)	not applicable	318.0 (0.30.3)	4,964.4 (6.4)	
	Total Licensed-Years	56,130.4	100,284.1	77,914.7	

**Based on licensed driver-years and adjusted for the shorter validity period for Pre-GLP drivers (where applicable).*
***Includes only those drivers who completed the full period of licensure.*

4.2.2 Characteristics of the Crash involvements of New Drivers During their First Four Years of Licensure

Approximately 25% of the GLP New driver cohorts were involved in at least one crash (based on claims data) during the first 2 years after obtaining their Learner's licence, and about 44% were involved in at least one crash during their first four years of licensure. This compares to about 28% and 44% of the Pre-GLP cohorts, respectively. Although the percentage was lower for GLP drivers ($P<0.0001$) during their first two years, the magnitude of the difference was small and disappeared by the end of four years of licensure. GLP drivers were also found, however, to have a significantly lower number of crashes per driver than the Pre-GLP comparison group, through all years of licensure ($P<0.0001$ in all cases). For example, during their first two years of licensure, GLP drivers reported 0.33 (SE = $\pm$ 0.0014) crash involvements per driver while Pre-GLP drivers reported 0.38 crashes (SE = $\pm$ 0.002). After four years of licensure GLP drivers were found to have had 0.71 (SE = $\pm$ 0.003) crashes while Pre-GLP drivers reported 0.76 (SE = $\pm$ 0.003). It should be noted that, while these findings may be suggestive of a GLP effect, they do not take into account any differences between the driver groups with respect to factors such as their exposure to risk (in terms of licensed driver-time), their age or gender distributions. Until the potentially confounding influence of such factors are examined and controlled, it is not possible to draw conclusions about the effectiveness of GLP. These data are reported here for descriptive purposes only.

Liability and severity. Tables 8 and 9 show the distribution of New driver crash involvements by length of licensure, crash type and the stage of licensure during which the crashes occurred. Although GLP was designed to reduce all New driver crash involvements, within that group there are several sub-categories of crashes which are of particular interest. For instance, 'at-fault' or 'liable' crashes – those for which the driver is deemed to be at least 50% responsible – are of interest because they reflect the impact of GLP on behaviours that lead New drivers to cause a crash. In contrast, non-liable crashes are more likely a consequence of driving exposure; New drivers who are on the road more, or under more difficult circumstances, are more likely to be involved in a crash caused by someone else than are drivers who drive less or under less difficult circumstances. Thus, while a change in the incidence of all New driver crashes is an important indicator of the overall impact of GLP (because the program is intended to impact both risk exposure and behaviour), it is also informative to separate out the program's effect on New driver 'liable' crashes. Similarly, to determine whether GLP had an impact on crash severity, casualty crashes (those involving at least one injury or fatality) were examined separately from crashes involving material (property) damage only. Although shown separately in Table 9, fatal crashes were not examined separately from casualty crashes due to the small number of these events in the study cohorts.

As shown in Tables 8 and 9, the percentages of liable and casualty crash involvements were relatively stable across all three driver cohorts and in each of the follow-up periods, particularly for Learner crashes. However, there were some patterns detected in the differences. A slightly higher percentage of the GLP than Pre-GLP driver crash involvements were deemed liable. For Learner crash involvements, the percentage of casualty crashes was lowest for the Full GLP group and differed little between the Early GLP and Pre-GLP groups. For Novice crash involvements, the percentage of casualty crashes was significantly lower ($P<0.0001$) for both GLP groups compared to the Pre-GLP group.

Although the magnitudes of the differences were small, the higher percentage of liable crash involvements found for GLP Novice drivers may reflect a change in the claims adjusting process or it could reflect an actual increase in the percentage of New drivers who cause crashes. It is not possible to tell from the available data what might have prompted the shift in liability. In contrast, the reduction in the percentage of casualty crash involvements for GLP drivers is not likely to have been due to any procedural changes. The same process for identifying casualty crashes was applied to all of the crashes.

Whether the small percentage differences discussed above represent meaningful changes in the frequency of New driver crash involvements will be discussed in a later section. The differences observed here will be revisited in the section of the report that describes the analysis of crash involvement rates. Rates permit adjustment for factors not taken into account when comparing differences in percentages (for example, differences between the groups in age, gender and licensed driver-time).

Table 8: Number (%) of New Driver Crash Involvements by the Licence Stage of the New Drivers involved in the Crash, their Years of Licensure at the Time of the Crash, and their Assigned Liability* for the Crash

Study Period	Licence Stage	Liability	Pre-GLP		Early GLP		Full GLP	
			1996	1997	1999	2000	2001	2002
First Year of Licensure	Learner	Liable	641 (67.0)	844 (65.0)	795 (67.2)	894 (69.3)	789 (67.5)	845 (69.2)
		Non-Liable	316 (33.0)	451 (35.8)	385 (33.5)	390 (30.2)	383 (32.3)	356 (29.2)
		Liability not Assigned	0 (0.0)	2 (0.2)	4 (0.3)	7 (0.5)	14 (1.2)	20 (1.6)
		Total	957 (100)	1297 (100)	1,184 (100)	1,291 (100)	1,186 (100)	1,221 (100)
	Novice	Liable	6,468 (66.0)	7,967 (66.7)	4,047 (68.7)	3,876 (68.7)	3,966 (69.4)	4,092 (69.5)
		Non-Liable	3,372 (34.0)	3,960 (33.2)	1,830 (31.0)	1,741 (30.9)	1,686 (29.5)	1,672 (28.4)
		Liability not Assigned	1 (0.0)	10 (0.1)	16 (0.3)	25 (0.4)	63 (1.1)	122 (2.1)
		Total	9,796 (100)	11,937 (100)	5,893 (100)	5,642 (100)	5,715 (100)	5,886 (100)
First 2 Years of Licensure	Learner	Liable	722 (66.7)	876 (65.3)	900 (66.5)	1,114 (68.9)	927 (66.3)	948 (68.3)
		Non-Liable	360 (33.30	464 (34.6)	450 (33.2)	493 (30.5)	453 (32.4)	418 (30.0)
		Liability not Assigned	0 (0.0)	2 (0.1)	4 (0.3)	10 (0.6)	19 (1.4)	23 (1.7)
		Total	1,082 (100)	1,342 (100)	1,354 (100)	1,617 (100)	1,399 (100)	1,389 (100)
	Novice	Liable	13,827 (61.1)	17,043 (61.9)	10,569 (63.5)	10,897 (63.2)	10,482 (64.7)	10,290 (64.9)
		Non-Liable	8,767 (38.8)	10,465 (38.0)	6,022 (36.1)	6,231 (36.1)	5,495 (33.9)	5,148 (32.5)
		Liability not Assigned	13 (0.1)	34 (0.1)	61 (0.4)	124 (0.7)	230 (1.4)	408 (2.6)
		Total	22,607 (100)	27,542 (100)	16,653 (100)	17,252 (100)	16,207 (100)	15,846 (100)
First 3 Years of Licensure	Learner	Liable	736 (66.7)	876 (65.3)	983 (66.2)	1,206 (68.6)	978 (66.5)	537 (66.4)
		Non-Liable	367 (33.3)	464 (34.6)	495 (33.3)	539 (30.7)	474 (32.2)	260 (32.1)
		Liability not Assigned	0 (0.0)	2 (0.1)	8 (0.5)	12 (0.7)	19 (1.3)	12 (1.5)
		Total	1,103 (100)	1,342 (100)	1,486 (100)	1,757 (100)	1,471 (100)	809 (100)
	Novice	Liable	20,535 (58.3)	24,921 (58.9)	16,624 (60.7)	16,957 (61.1)	15,829 (62.1)	8,543 (62.2)
		Non-Liable	14,647 (41.6)	17,361 (41.00)	10,633 (38.8)	10,486 (37.8)	9,190 (36.0)	4,770 (34.7)
		Liability not Assigned	28 (0.1)	64 (0.1)	148 (0.5)	291 (1.1)	492 (1.9)	427 (3.1)
		Total	35,210 (100)	42,346 (100)	27,405 (100)	27,734 (100)	25,511 (100)	13,740 (100)
First 4 Years of Licensure	Learner	Liable	736 (66.7)	876 (65.3)	1,027 (66.3)	1,256 (68.5)	571 (65.3)	-
		Non-Liable	367 (33.3)	464 (34.6)	513 (33.1)	566 (30.8)	296 (33.9)	-
		Liability not Assigned	0 (0.0)	2 (0.1)	10 (0.6)	13 (0.7)	7 (.8)	-
		Total	1,103 (100)	1,342 (100)	1,550 (100)	1,835 (100)	874 (100)	-
	Novice	Liable	26,299 (56.2)	31,870 (56.7)	21,613 (58.7)	22,091 (59.3)	11,299 (60.3)	-
		Non-Liable	20,480 (43.7)	24,231 (43.1)	14,944 (40.5)	14,568 (39.1)	6,957 (37.1)	-
		Liability not Assigned	48 (0.1)	123 (0.2)	294 (0.8)	580 (1.6)	495 (2.6)	-
		Total	46,827 (100)	56,224 (100)	36,851 (100)	37,239 (100)	18,751 (100)	-

**Liability is assigned to a driver who is found (by a claims adjuster) to be at least 50% responsible for the crash*

Table 9: Number (%) of New Driver Crash Involvements by the Licence Stage of the Drivers involved in the Crash, their Years of Licensure at the Time of the Crash, and the Severity of the Crash

Study Period	Licence Stage	Severity	Pre-GLP		Early GLP		Full GLP	
			1996	1997	1999	2000	2001	2002
First Year of Licensure	Learner	Fatal	1 (0.1)	2 (0.2)	4 (0.3)	2 (0.2)	3 (0.3)	5 (0.4)
		Injury	288 (30.1)	374 (28.8)	363 (30.7)	380 (29.4)	322 (27.2)	325 (26.6)
		Material Damage Only	668 (69.8)	921 (71.0)	817 (69.0)	909 (70.4)	861 (72.6)	891 (73.0)
		Total	957 (100)	1,297 (100)	1,184 (100)	1,291 (100)	1,186 (100)	1,221 (100)
	Novice	Fatal	13 (0.1)	18 (0.2)	8 (0.1)	8 (0.1)	11 (0.2)	5 (0.1)
		Injury	2,998 (30.6)	3,654 (30.6)	1,650 (28.0)	1,556 (27.6)	1,541 (27.0)	1,696 (28.8)
		Material Damage Only	6,785 (69.3)	8,265 (69.2)	4,235 (71.9)	4,087 (72.3)	4,163 (72.8)	4,185 (71.1)
		Total	9,796 (100)	11,937 (100)	5,893 (100)	5,642 (100)	5,715 (100)	5,886 (100)
First 2 Years of Licensure	Learner	Fatal	1 (0.1)	2 (0.2)	4 (0.3)	3 (0.2)	6 (0.4)	5 (0.4)
		Injury	334 (30.9)	386 (28.8)	422 (31.2)	488 (30.2)	384 (27.5)	379 (27.3)
		Material Damage Only	747 (69.0)	954 (71.0)	928 (68.5)	1,126 (69.6)	1,009 (72.1)	1,005 (72.3)
		Total	1,082 (100)	1,342 (100)	1,354 (100)	1,617 (100)	1,399 (100)	1,389 (1000)
	Novice	Fatal	28 (0.1)	34 (0.1)	24 (0.1)	22 (0.1)	21 (0.1)	20 (0.1)
		Injury	7,000 (31.0)	8,387 (30.5)	4,784 (28.7)	4,801 (27.8)	4,565 (28.2)	4,581 (28.9)
		Material Damage Only	15,579 (68.9)	19,121 (69.4)	11,844 (71.1)	12,429 (72.0)	11,621 (71.7)	11,245 (71.0)
		Total	22,607 (100)	27,542 (100)	16,652 (100)	17,252 (100)	16,207 (100)	15,846 (100)
First 3 Years of Licensure	Learner	Fatal	1 (0.1)	2 (0.1)	4 (0.3)	4 (0.2)	7 (0.5)	3 (0.4)
		Injury	344 (31.2)	386 (28.8)	472 (31.7)	537 (30.6)	400 (27.2)	221 (27.3)
		Material Damage Only	758 (68.7)	954 (71.1)	1,010 (68.0)	1,216 (69.2)	1,064 (72.3)	585 (72.3)
		Total	1,103 (100)	1,342 (100)	1,486 (100)	1,757 (100)	1,471 (100)	809 (100)
	Novice	Fatal	47 (0.1)	52 (0.1)	42 (0.2)	37 (0.1)	36 (0.1)	13 (0.1)
		Injury	10,957 (31.1)	12,811 (30.3)	7,888 (28.8)	7,964 (28.7)	7,273 (28.5)	3,964 (28.9)
		Material Damage Only	24,206 (68.8)	29,483 (69.6)	19,475 (71.0)	19,733 (71.2)	18,202 (71.4)	9,763 (71.0)
		Total	35,210 (100)	42,346 (100)	27,405 (100)	27,734 (100)	25,511 (100)	13,740 (100)
First 4 Years of Licensure	Learner	Fatal	1 (0.1)	2 (0.2)	4 (0.3)	4 (0.2)	4 (0.5)	-
		Injury	344 (31.2)	386 (28.8)	497 (32.1)	563 (30.7)	251 (28.7)	-
		Material Damage Only	758 (68.7)	954 (71.0)	1,049 (67.6)	1,268 (69.1)	619 (70.8)	-
		Total	1,103 (100)	1,342 (100)	1,550 (100)	1,835 (100)	874 (100)	-
	Novice	Fatal	61 (0.1)	70 (0.1)	56 (0.1)	50 (0.1)	26 (0.1)	-
		Injury	14,557 (31.1)	16,719 (29.7)	10,722 (29.1)	10,712 (28.8)	5,377 (28.7)	-
		Material Damage Only	32,209 (68.8)	39,435 (70.2)	26,073 (70.8)	26,477 (71.1)	13,348 (71.2)	-
		Total	46,827 (100)	56,224 (100)	36,851 (100)	37,239 (100)	18,751 (100)	-

Compliance among the crash-involved. With the introduction of GLP several restrictions were placed on Learner drivers. They were prohibited from driving between midnight and 5:00am, and were not permitted to drive with more than 2 passengers in the vehicle (one of whom had to be an adult supervisor). Learner and Novice drivers are also not permitted to drink and drive (zero blood alcohol content). Although self-reported support for and compliance with the rules and conditions of graduated licensing tends to be quite high both in BC (Wiggins, 2004) and in other jurisdictions (Hedlund, et. al., 2003), actual compliance has not been well documented. To explore this issue the relative frequency of certain crash characteristics were examined. Thus, for example, if GLP Learner drivers are 100% compliant with GLP rules then crashes involving drinking and driving, multiple passengers, and that occur between midnight at 5:00am would be non-existent. Similarly, there would be no Novice crashes involving a drinking Novice driver. Although it is not possible to calculate crash rates for each of these conditions (appropriate denominators are not available) the relative frequency of crashes in the Pre-GLP and GLP cohorts may suggest whether there has been an impact on crashes in the expected directions.

As noted in an earlier section of this report, the ICBC Claims (BIWC) data system (which was used to obtain the crash involvement counts provided in Tables 8 and 9) provides limited or no information concerning the occupants of the vehicles involved in crashes, the time when the crash occurred and the likelihood of alcohol impairment on the part of the driver. To obtain this kind of information, it is necessary to examine the characteristics of crashes reported through the Traffic Accident System (TAS). Due to changes in police reporting practices, the number of crashes reported in TAS are much smaller than those reported through the ICBC Claims system. Consequently, TAS data cannot be used for estimating crash involvement rates. However, they do permit calculation of the relative frequency of crashes that occur under the restricted conditions of GLP and, hence, can serve as an indicator of compliance among crash-involved New drivers.

Tables 10 through 12 show the frequency distribution of Learner and Novice driver crash involvements by whether or not alcohol was reported by police as a contributing factor (on the part of the Learner or Novice driver) to the crash, by the time of day when they occurred, and by the number and ages of any passengers in the vehicle at the time, and. The results shown in these tables indicate that, among the drivers who were involved in crashes, there was at least some non-compliance with GLP restrictions and conditions. Although not common amongst New drivers, crashes involving drinking and driving were not eliminated after the introduction of GLP, a fairly consistent percentage of the crash involvements of Learner drivers occurred during the restricted hours of midnight to 5:00 AM, and more than half of the Learner crashes occurred when the driver was in violation of the Learner passenger restrictions.

Although the findings concerning the characteristics of Learner and Novice driver crashes are interesting, they are limited. The data provide no information about GLP drivers who were not involved in crashes, nor do they provide an indication as to the extent of non-compliant behaviour among the crash involved. For that, information about the amount of driving being done under the restricted conditions would be required. Such information was not available for this study. However, in a recent survey of young (16-17 year old) BC Novice drivers and their parents (Mayhew et. al., 2006), about 90% of both groups indicated that, as Learners, the young drivers had never breached the requirement to drive only with a supervising adult in the vehicle. Moreover, no differences in percentage compliance were found between the crash-free and crash-involved groups with respect to this condition. Similarly, no differences were found between the crash-free and crash-involved young drivers with respect to the percentage who reported always displaying their “N” sign. Compliance for both groups was reported to be about 80%. While not a complete assessment of compliance with GLP conditions, these self-report data do suggest that compliance may be reasonably high during the Learner stage. This is assuming, of course, that compliance with all of the Learner stage conditions would be achieved while the supervising driver was in the vehicle. The data also suggest that there may not be major differentials in compliance between Novice drivers who are crash involved and those who are not. However, more research in this area is required.

Table 10: Number (%) of Driver Crash Involvements* by the Licence Stage of the New Drivers involved in the Crash, their Years of Licensure when the Crash occurred, and whether or not Police identified Alcohol as a New Driver Contributing Factor

Study Period	Licence Stage	Alcohol Involvement	Pre-GLP		Early GLP		Full GLP	
			1996	1997	1999	2000	2001	2002
First Year of Licensure	Learner	Yes	11 (3.1)	15 (4.5)	31 (9.1)	33 (9.0)	25 (7.8)	38 (10.2)
		No	339 (96.9)	321 (95.5)	310 (90.9)	332 (91.0)	294 (92.2)	335 (89.8)
		Total	350 (100)	336 (100)	341 (100)	365 (100)	319 (100)	373 (100)
	Novice	Yes	92 (3.4)	103 (3.5)	33 (2.2)	49 (3.3)	34 (2.1)	46 (2.6)
		No	2,647 (96.6)	2,868 (96.5)	1,472 (97.8)	1,434 (96.7)	1,561 (97.9)	1,750 (97.4)
		Total	2,739 (100)	2,971 (100)	1,.505 (100)	1,483 (100)	1,595 (100)	1,796 (100)
First 2 Years of Licensure	Learner	Yes	13 (3.4)	16 (4.6)	40 (9.9)	45 (9.6)	27 (7.0)	41 (9.8)
		No	373 (96.6)	330 (95.4)	362 (90.1)	423 (90.4)	358 (93.0)	378 (90.2)
		Total	386 (100)	346 (100)	402 (100)	468 (100)	385 (100)	419 (100)
	Novice	Yes	214 (4.0)	258 (4.2)	130 (3.2)	158 (3.6)	155 (3.6)	153 (3.4)
		No	5,185 (96.0)	5,914 (95.8)	3,934 (96.8)	4,217 (96.4)	4,134 (96.4)	4,380 (96.6)
		Total	5,399 (100)	6,172 (100)	4,064 (100)	4,375 (100)	4,289 (100)	4,533 (100)
First 3 Years of Licensure	Learner	Yes	13 (3.3)	16 (4.6)	43 (9.7)	48 (9.3)	31 (7.7)	26 (11.4)
		No	379 (96.7)	330 (95.4)	401 (90.3)	471 (90.7)	373 (92.7)	203 (88.6)
		Total	392 (100)	346 (100)	444 (100)	519 (100)	404 (100)	229 (100)
	Novice	Yes	346 (4.5)	438 (4.9)	268 (4.2)	329 (4.8)	270 (4.1)	156 (4.2)
		No	7,346 (95.5)	8,472 (95.1)	6,165 (95.8)	6,540 (95.2)	6,270 (95.9)	3,605 (95.8)
		Total	7,692 (100)	8,910 (100)	6,433 (100)	6,869 (100)	6,540 (100)	3,761 (100)
First 4 Years of Licensure	Learner	Yes	13 (3.3)	16 (4.6)	45 (9.7)	53 (9.7)	20 (8.6)	-
		No	379 (96.7)	330 (95.4)	418 (90.3)	494 (90.3)	213 (91.4)	-
		Total	392 (100)	346 (100)	463 (100)	547 (100)	233 (100)	
	Novice	Yes	513 (5.3)	648 (5.7)	431 (5.1)	507 (5.7)	218 (4.7)	-
		No	9,151 (94.7)	10,669 (94.3)	8,023 (94.9)	8,454 (94.3)	4,377 (95.3)	-
		Total	9,664 (100)	11,317 (100)	8,454 (100)	8,961 (100)	4,595 (100)	-

**Crash counts reported here differ from those in Tables 8 and 9 because they were taken from the Traffic Accident System rather than from ICBC Claims.*

Table 11: Number (%) of New Driver Crash Involvements* by the Licence Stage of the New Drivers involved in the Crash, their Years of Licensure when the Crash occurred, and the Time of Day

Study Period	Licence Stage	Time of Crash	Pre-GLP		Early GLP		Full GLP	
			1996	1997	1999	2000	2001	2002
First Year of Licensure	Learner	Midnight – 5:00 am	20 (5.7)	32 (9.5)	33 (9.7)	31 (8.5)	33 (10.3)	38 (10.2)
		5:00 am – 5:00 pm	201 (57.4)	172 (51.2)	157 (46.0)	175 (48.0)	161 (50.5)	182 (48.8)
		5:00 pm – Midnight	124 (35.4)	126 (37.5)	145 (42.5)	152 (41.6)	108 (33.9)	143 (38.3)
		Unknown	5 (1.4)	6 (1.8)	6 (1.8)	7 (1.9)	17 (5.3)	10 (2.7)
		Total	350 (100)	336 (100)	341 (100)	365 (100)	319 (100)	373 (100)
	Novice	Midnight – 5:00 am	197 (7.2)	230 (7.7)	123 (8.2)	125 (8.4)	104 (6.5)	157 (8.7)
		5:00 am – 5:00 pm	1,375 (50.2)	1,441 (48.5)	683 (45.4)	710 (47.9)	750 (47.0)	880 (49.0)
		5:00 pm – Midnight	1,129 (41.2)	1,239 (41.7)	672 (44.6)	619 (41.7)	705 (44.2)	718 (40.0)
		Unknown	38 (1.4)	61 (2.1)	27 (1.8)	29 (2.0)	36 (2.3)	41 (2.3)
		Total	2,739 (100)	2,971 (100)	1,.505 (100)	1,483 (100)	1,595 (100)	1,796 (100)
First 2 Years of Licensure	Learner	Midnight – 5:00 am	26 (6.7)	33 (9.5)	43 (10.7)	42 (9.0)	41 (10.6)	40 (9.6)
		5:00 am – 5:00 pm	220 (57.0)	177 (51.2)	183 (45.5)	230 (49.1)	194 (50.4)	209 (49.9)
		5:00 pm – Midnight	134 (34.7)	130 (37.6)	170 (42.3)	189 (40.4)	132 (34.3)	159 (37.9)
		Unknown	6 (1.6)	6 (1.7)	6 (1.5)	7 (1.5)	18 (4.7)	11 (2.6)
		Total	386 (100)	346 (100)	402 (100)	468 (100)	385 (100)	419 (100)
	Novice	Midnight – 5:00 am	474 (8.8)	571 (9.2)	402 (9.9)	396 (9.0)	374 (8.7)	419 (9.2)
		5:00 am – 5:00 pm	2,645 (49.0)	3,047 (49.4)	1,906 (46.9)	2,126 (48.6)	2,098 (48.9)	2,271 (50.1)
		5:00 pm – Midnight	2,194 (40.6)	2,425 (39.3)	1.682 (41.4)	1,754 (40.1)	1,718 (40.1)	1,745 (38.5)
		Unknown	86 (1.6)	129 (2.1)	74 (1.8)	99 (2.3)	99 (2.3)	98 (2.2)
		Total	5,399 (100)	6,172 (100)	4,064 (100)	4,375 (100)	4,289 (100)	4,533 (100)
First 3 Years of Licensure	Learner	Midnight – 5:00 am	26 (6.6)	33 (9.5)	49 (11.0)	45 (8.7)	43 (10.6)	24 (10.5)
		5:00 am – 5:00 pm	224 (57.1)	177 (51.2)	207 (46.6)	258 (49.7)	204 (50.5)	119 (52.0)
		5:00 pm – Midnight	136 (34.7)	130 (37.6)	180 (40.6)	209 (40.3)	139 (34.4)	79 (34.5)
		Unknown	6 (1.5)	6 (1.7)	8 (1.8)	7 (1.3)	18 (4.5)	7 (3.0)
		Total	392 (100)	346 (100)	444 (100)	519 (100)	404 (100)	229 (100)
	Novice	Midnight – 5:00 am	733 (9.5)	916 (10.3)	696 (10.8)	689 (10.0)	635 (9.7)	347 (9.2)
		5:00 am – 5:00 pm	3,776 (49.1)	4,407 (49.5)	3,146 (48.9)	3,385 (49.3)	3,240 (49.5)	1,875 (49.8)
		5:00 pm – Midnight	3,059 (39.8)	3,413 (38.3)	2,469 (38.4)	2,633 (38.3)	2,518 (38.5)	1,465 (39.0)
		Unknown	124 (1.6)	174 (1.9)	122 (1.9)	162 (2.4)	147 (2.3)	74 (2.0)
		Total	7,692 (100)	8,910 (100)	6,433 (100)	6,869 (100)	6,540 (100)	3,761 (100)
First 4 years of Licensure	Learner	Midnight – 5:00 am	26 (6.6)	33 (9.5)	50 (10.8)	50 (9.1)	29 (12.5)	-
		5:00 am – 5:00 pm	224 (57.1)	177 (51.2)	218 (47.1)	277 (50.7)	120 (51.5)	-
		5:00 pm – Midnight	136 (34.7)	130 (37.6)	187 (40.4)	213 (38.9)	78 (33.5)	-
		Unknown	6 (1.5)	6 (1.7)	8 (1.7)	7 (1.3)	6 (2.5)	-
		Total	392 (100)	346 (100)	463 (100)	547 (100)	233 (100)	-
	Novice	Midnight – 5:00 am	1,030 (10.6)	1,296 (11.5)	977 (11.6)	981 (10.9)	459 (10.0)	-
		5:00 am – 5:00 pm	4,763 (49.3)	5,601 (49.5)	4,131 (48.9)	4,416 (49.3)	2,275 (49.5)	-
		5:00 pm – Midnight	3,726 (38.6)	4,210 (37.2)	3,184 (37.6)	3,365 (37.6)	1,748 (38.0)	-
		Unknown	145 (1.5)	210 (1.8)	162 (1.9)	199 (2.2)	113 (2.5)	-
		Total	9,664 (100)	11,317 (100)	8,454 (100)	8,961 (100)	4,595 (100)	-

**Crash counts reported here differ from those in Tables 8 and 9 because they were taken from the Traffic Accident System rather than from ICBC Claims.*

Table 12: Number (%) of New Driver Crash Involvements* by the Licence Stage of the Drivers involved in the Crash, their Years of Licensure when the Crash occurred, and the Number and Ages of Passengers

Study Period	Licence Stage	Passengers in Vehicle	Pre-GLP		Early GLP		Full GLP	
			1996	1997	1999	2000	2001	2002
First Year of Licensure	Learner	No more than 2 – at least 1 of whom was 19 or older	161 (46.3)	157 (47.3)	153 (44.9)	153 (41.9)	159 (49.8)	155 (41.6)
		None (and no supervisor)	115 (33.1)	106 (31.9)	91 (26.7)	125 (34.3)	98 (30.7)	144 (38.6)
		1 or more – all under 19	36 (10.3)	39 (11.8)	67 (19.7)	61 (16.7)	47 (14.7)	50 (13.4)
		Unknown	36 (10.3)	30 (9.0)	30 (8.8)	26 (7.1)	15 (4.7)	24 (6.4)
		Total	348 (100)	332 (100)	341 (100)	348 (100)	319 (100)	373 (100)
	Novice	No more than 2 – at least 1 of whom was 19 or older	366 (13.4)	345 (11.6)	118 (7.8)	111 (7.5)	127 (8.0)	126 (7.0)
		None (and no supervisor)	1,284 (46.9)	1,473 (49.6)	680 (45.2)	668 (45.0)	770 (48.3)	1,008 (56.1)
		1 or more – all under 19	897 (32.7)	956 (32.2)	616 (40.9)	614 (41.4)	609 (38.2)	589 (32.8)
		Unknown	192 (7.0)	197 (6.6)	91 (6.0)	90 (6.1)	87 (5.5)	73 (4.1)
		Total	2,739 (100)	2,971 (100)	1,505 (100)	1,483 (100)	1,593 (100)	1,796 (100)
First 2 Years of Licensure	Learner	No more than 2 – at least 1 of whom was 19 or older	183 (47.4)	163 (47.1)	176 (43.8)	204 (43.6)	178 (46.2)	169 (40.3)
		None (and no supervisor)	123 (31.9)	111 (32.1)	114 (28.4)	161 (34.4)	124 (32.2)	165 (39.4)
		1 or more – all under 19	41 (10.6)	41 (11.8)	77 (19.1)	70 (15.0)	58 (15.1)	57 (13.6)
		Unknown	39 (10.1)	31 (9.0)	35 (8.7)	33 (7.0)	25 (6.5)	28 (6.7)
		Total	386 (100)	346 (100)	402 (100)	468 (100)	385 (100)	419 (100)
	Novice	No more than 2 – at least 1 of whom was 19 or older	727 (13.5)	807 (13.1)	405 (10.0)	379 (8.7)	371 (8.7)	424 (9.4)
		None (and no supervisor)	2,718 (50.3)	3,185 (51.6)	2,048 (50.4)	2,248 (51.4)	2,407 (56.1)	2,630 (58.0)
		1 or more – all under 19	1,591 (29.5)	1,777 (28.8)	1,387 (34.1)	1,521 (34.8)	1,320 (30.8)	1,325 (29.2)
		Unknown	363 (6.7)	403 (6.5)	224 (5.5)	227 (5.2)	191 (4.4)	153 (3.4)
		Total	5,399 (100)	6,172 (100)	4,064 (100)	4,375 (100)	4,289 (100)	4,533 (100)
First 3 Years of Licensure	Learner	No more than 2 – at least 1 of whom was 19 or older	188 (48.0)	163 (47.1)	195 (43.9)	229 (44.1)	185 (45.8)	93 (40.6)
		None (and no supervisor)	124 (31.6)	111 (32.1)	131 (29.5)	181 (34.9)	134 (33.2)	90 (39.3)
		1 or more – all under 19	40 (10.2)	41 (11.8)	79 (17.8)	69 (13.3)	57 (14.1)	31 (13.5)
		Unknown	40 (10.2)	31 (9.0)	39 (8.8)	40 (7.7)	28 (6.9)	15 (6.6)
		Total	392 (100)	346 (100)	444 (100)	519 (100)	404 (100)	229 (100)
	Novice	No more than 2 – at least 1 of whom was 19 or older	1,142 (14.8)	1,351 (15.2)	751 (11.7)	757 (11.0)	739 (11.3)	415 (11.0)
		None (and no supervisor)	4,102 (53.3)	4,819 (54.1)	3,524 (54.8)	3,889 (56.6)	3,839 (58.7)	2,283 (60.7)
		1 or more – all under 19	1,952 (25.4)	2,220 (24.9)	1,835 (28.5)	1,916 (27.9)	1,709 (26.1)	944 (25.1)
		Unknown	496 (6.5)	520 (5.8)	323 (5.0)	307 (4.5)	253 (3.9)	119 (3.2)
		Total	7,692 (100)	8,910 (100)	6,433 (100)	6,869 (100)	6,540 (100)	3,761 (100)
First 4 Years of Licensure	Learner	No more than 2 – at least 1 of whom was 19 or older	188 (48.0)	163 (47.1)	201 (43.4)	237 (43.3)	111 (47.6)	-
		None (and no supervisor)	124 (31.6)	111 (32.1)	142 (30.7)	197 (36.0)	70 (30.0)	-
		1 or more – all under 19	40 (10.2)	41 (11.8)	80 (17.3)	71 (13.0)	33 (14.2)	-
		Unknown	40 (10.2)	31 (9.0)	40 (8.6)	42 (7.7)	19 (8.2)	-
		Total	392 (100)	346 (100)	463 (100)	547 (100)	233 (100)	-
	Novice	No more than 2 – at least 1 of whom was 19 or older	1,583 (16.4)	1,915 (16.9)	1,177 (13.9)	1,251 (14.0)	593 (12.9)	-
		None (and no supervisor)	5,358 (55.4)	6,348 (56.1)	4,878 (57.7)	5,240 (58.5)	2,804 (61.0)	-
		1 or more – all under 19	2,139 (22.1)	2,429 (21.5)	2,003 (23.7)	2,108 (23.5)	1,026 (22.3)	-
		Unknown	584 (6.1	625 (5.5)	396 (4.7)	362 (4.0)	172 (3.7)	-
		Total	9,664 (100)	11,317 (100)	8,454 (100)	8,961 (100)	4,595 (100)	-

**Crash counts reported here differ from those in Tables 8 and 9 because they were taken from the Traffic Accident System rather than from ICBC Claims.*

4.2.3 New Driver Crash Involvement Rates

New driver crash involvement rates were calculated for all four GLP cohorts (intake years 1999, 2000, 2001, and 2002) and the two Pre-GLP cohorts (intake years 1996, 1997), as well as for the aggregated Pre-GLP (1996-1997), Early GLP (1999-2000) and Full GLP (2001-2002) groups. Within each group, short-term (first year of licensure and first two years of licensure) and longer-term (first three and four years of licensure) rates were calculated as follows:

1) for all New drivers regardless of their progress through the licensing system within each stated period of licensure,

2) for only those New drivers who progressed to the Novice stage (or to their first solo licence) within each stated period of licensure,

3) for only those GLP drivers who completed all of the required GLP components and graduated out of the program within each stated period of licensure.

The rates for all New drivers were calculated in two ways. First, using driver counts in the denominators and second, using licensed driver-years adjusted for the shorter validity term of Pre-GLP Learner licences. As noted in Section 3.3, the rates based on driver counts are provided for descriptive purposes only as they do not take into account differences between the groups in the amount of actual licensed driver-time contributed. However, they are commonly used denominators in other jurisdictions and are provided here for comparative purposes. As would be expected, rates calculated using denominators adjusted for unlicensed-time (Table 14) are slightly higher than those based solely on driver counts (Table 13).

The rates summarized in Tables 13 and 14 show the overall impact of GLP on New driver crash rates over time. The drivers included in the rate calculations may have been exposed to all components of licensing process, to the Learner stage only, or to only the Learner and early Novice stage components. Thus, the drivers included in each group may be at quite different levels of exposure and crash risk. To minimize some of these differences, Table 15 shows the rates after they were recalculated using only those drivers who had progressed to the Novice (or solo licence) stage during each of the four specified time periods and Table 16 shows the rates calculated for GLP program graduates. It is these rates that provide a measure of the overall impact of GLP on New driver crash involvement rates. However, the data for these drivers are limited by the fact that only a small percentage (less than 30%) of the GLP cohorts obtained their Full Privilege licence by the end of the study, and those who did were motivated to move through the system quickly. These drivers may not be representative of the full complement of drivers in the cohorts and, consequently, their rates may not provide an accurate estimate of each group's rates. For this reason, the rates calculated for program graduates must be considered preliminary.

Table 13 shows the rates calculated for each intake driver group as well as for each licensing program (Pre-GLP, Early GLP, Full GLP). As can be seen, when total crash rates were compared, the average 1-year rates was about 17.4 per 100 Pre-GLP drivers and about 13.0 per 100 Early and Full GLP drivers; the average 2-year rates were about 19.4 per 100 Pre-GLP drivers, 17.2 per 100 Early GLP drivers and about 16.7 per 100 Full GLP drivers. There was some variability across the annual intake years but in no case did the rates differ by more than 1 crash involvement per 100 drivers and, in many cases, the difference was much less. A similar pattern was observed across the groups when the crash involvements were limited to liable crashes, casualty, and material damage only crashes.

Table 13: New Driver Crash Involvement Rates (per 100 drivers) and 95% Confidence Intervals (CI) by Intake Year, Program, and Years of Licensure

Crash Type by Years of Licensure	Pre-GLP Intake Year			Early GLP Intake Year			Full GLP Intake Year		
	1996	1997	1996-1997	1999	2000	1999-2000	2001	2002	2001-2002
	Rate (95% CI) (N=60,174)	Rate (95% CI) (N=77,924)	Average Rate (95% CI) (N=138,098_	Rate (95% CI) (N=52,204)	Rate (95% CI) (N=55,193)	Average Rate (95% CI) (N=107,397)	Rate (95% CI) (N=50,808)	Rate (95% CI) (N=56,499)	Average Rate (95% CI) (107,307)
All Crashes:									
1st Year	17.87 (17.53– 18.21)	16.98 (16.69 – 17.27)	17.37 (17.15 – 17.59)	13.56 (13.24– 13.88)	12.56 (12.26 – 12.86)	13.05 (12.83 – 13.27)	13.58 (13.26 – 13.90)	12.58 (12.29 – 12.87)	13.05 (12.83– 13.27)
1st Two Years	19.69 (19.44 – 19.94)	18.53 (18.32 – 18.74)	19.04 (18.88 – 19.20)	17.25 (17.00 – 17.50)	17.09 (16.85 – 17.28)	17.17 (16.99 – 17.35)	17.33 (17.07 – 17.59	15.25 (15.02– 15.48)	16.24 (16.07– 16.41)
1st Three Years	20.12 (19.91-20.33)	18.69 (18.51-18.87)	19.31 (19.18-19.44)	18.45 (18.24-18.66)	17.81 (17.61-18.01)	18.12 (17.97-18.27)	17.70 (17.49-17.91)	15.86 (15.60-16.12)	17.01 (16.85-17.17)
1st Four Years	19.91 (19.73-20.09)	18.47 (18.32-18.62)	19.10 (18.98-19.22)	18.39 (18.21-18.57)	17.70 (17.52-17.88)	18.04 (17.91-18.17)	17.73 (17.48-17.98)	-	-
Liable Crashes:									
1st Year	11.81 (11.54 – 12.08)	11.31 (11.07– 11.55)	11.53 (11.35 – 11.71)	9.28 (9.02 – 9.54)	8.64 (8.39 – 8.89)	8.95 (8.77 – 9.13)	9.36 (9.09 – 9.63)	8.74 (8.50 – 8.98)	9.03 (8.85 – 9.21)
1st Two Years	12.09 (11.89 – 12.29)	11.50 (11.32 – 11.66)	11.76 (11.63– 11.89)	10.99 (10.79 – 11.19)	10.88 (10.69 – 11.07)	10.93 (10.79 – 11.07)	11.23 (11.02 – 11.44)	9.95 (9.77 – 10.13)	10.55 (10.41 – 10.69)
1st Three Years	11.78 (11.62-11.94)	11.04 (10.90-11.17)	11.36 (11.26-11.46)	11.24 (11.07-11.41)	10.97 (10.81-11.13)	11.10 (10.98-11.22)	11.03 (10.86-11.20)	9.90 (9.70-10.10)	10.60 (10.47-10.73)
1st Four Years	11.23 (11.10-11.36)	10.51 (10.40-10.62)	10.82 (10.73-10.91)	10.84 (10.70-10.98)	10.58 (10.44-10.72)	10.71 (10.61-10.81)	10.72 (10.53-10.91)	-	-
Casualty Only:									
1st Year	5.48 (5.29 – 5.67)	5.20 (5.04 – 5.36)	5.32 (5.20 – 5.44)	3.88 (3.71 – 4.05)	3.53 (3.37 – 3.69)	3.70 (3.58 – 3.82)	3.69 (3.52 – 3.86)	3.59 (3.43 – 3.75)	3.64 (3.53 – 3.75)
1st Two Years	6.12 (5.98 – 6.26)	5.65 (5.53 – 5.77)	5.86 (5.77 – 5.95)	5.01 (4.87 – 5.15)	4.81 (4.68 – 4.94)	4.91 (4.82 – 5.00)	4.90 (4.76 – 5.04)	4.41 (4.29 – 4.53)	4.64 (4.55 – 4.73)
1st Three Years	6.29 (6.17-6.41)	5.67 (5.57-5.77)	5.94 (5.87-6.01)	5.37 (5.26-5.48)	5.16 (5.05-5.27)	5.26 (5.18-5.34)	5.06 (5.05-5.27)	4.58 (4.44-4.72)	4.88 (4.79-4.97)
1st Four Years	6.22 (6.12-6.32)	5.51 (5.43-5.59)	5.82 (5.76-5.88)	5.40 (5.30-5.50)	5.13 (5.04-5.22)	5.26 (5.19-5.33)	5.11 (4.98-5.24)	-	-
Material Damage:									
1st Year	12.39 (12.11 – 12.67)	11.79 (11.55 – 12.03)	12.05 (11.87 – 12.23)	9.68 (9.41 – 9.95)	9.04 (8.79 – 9.29)	9.35 (9.17 – 9.53)	9.89 (9.62 – 10.16)	8.98 (8.73– 9.23)	9.41 (9.23– 9.59)
1st Two Years	13.57 (13.36 – 13.78)	12.88 (12.70 – 13.06)	13.18 (13.04– 13.32)	12.23 (12.02 – 12.44)	12.28 (12.07 – 12.49)	12.26 (12.11 – 12.41)	12.43 (12.21 – 12.65)	10.84 (10.65 – 11.03)	11.59 (11.45 – 11.73)
1st Three Years	13.83 (13.66-14.00)	13.02 (12.87-13.17)	13.37 (13.26-13.48)	13.08 (12.90-13.26)	12.65 (12.48-12.82)	12.86 (12.74-12.98)	12.64 (12.46-12.82)	11.28 (11.96-11.50)	12.13 (11.99-12.27)
1st Four Years	13.70 (13.55-13.85)	12.96 (12.83-13.09)	13.28 (13.18-13.38)	12.99 (12.84-13.14)	12.57 (12.42-12.72)	12.77 (12.66-12.88)	12.62 (12.41-12.83)	-	-

Table 14 summarizes the crash involvement rates for New driver after adjusting the denominators for unlicensed time and for the shorter validity period of the Pre-GLP Learner licence. The adjustment for unlicensed time tends to increase the crash rate while the adjustment for the Pre-GLP Learner validity period reduces the rate somewhat for Pre-GLP drivers. The net effect of both adjustments resulted in slightly higher rates across all the groups. Within each licensing program, the variability across intake years was again less than 1 crash per 100 licensed driver-years.

Table 14: New Driver Crash Involvement Rates (per 100 licensed driver-years) and 95% Confidence Intervals (CI) by Intake Year, Program, and Years of Licensure

	Pre-GLP Intake Year			**Early GLP Intake Year**			**Full GLP Intake Year**		
	1996	**1997**	**1996-1997**	**1999**	**2000**	**1999-2000**	**2001**	**2002**	**2001-2002**
Crash Type by Years of Licensure	Rate (95% CI) (N=60,174)	Rate (95% CI) (N=77,924)	Average Rate (95% CI) (N=138,098)	Rate (95% CI) (N=52,204)	Rate (95% CI) (N=55,193)	Average Rate (95% CI) (N=107,397)	Rate (95% CI) (N=50,808)	Rate (95% CI) (N=56,499)	Average Rate (95% CI) (107,307)
All Crashes:									
1st Year	18.34 (17.99-18.69)	17.39 (17.09-17.69)	17.80 (17.57-18.03	13.63 (13.31-13.95)	12.63 (12.33-12.93)	13.12 (12.90-13.34)	13.65 (13.33-13.97)	12.66 (12.37-12.95)	13.13 (12.91-13.35)
1st Two Years	22.10 (22.82-22.38)	20.71 (20.47-20.95)	21.31 (21.13-21.49)	18.41 (18.14-18.68)	18.30 (18.04-18.56)	18.35 (18.16 – 18.54)	18.38 (18.11-18.65)	17.19 (16.93-17.45)	17.77 (17.58-17.96)
1st Three Years	23.37 (23.13-23.61)	21.99 (21.78-22.2)	22.60 (22.44-22.76)	20.20 (19.97-20.43)	19.56 (19.34-19.78)	19.87 (19.71-20.02)	19.48 (19.25-19.71)	18.67 (18.37-18.97)	19.19 (19.01-19.37)
1st Four Years	23.71 (23.50-23.92)	22.45 (22.27-22.63)	23.01 (22.87-23.15)	20.48 (20.28-20.68)	19.92 (19.72-20.12)	20.20 (20.06-20.34)	20.20 (19.92-20.48)	-	-
Liable Crashes:									
1st Year	12.13 (11.85 – 12.40)	11.57 (11.33 – 11.81)	11.82 (11.64 – 12.00)	9.33 (9.13 – 9.53)	8.69 (8.4 4– 8.94)	9.00 (8.82 – 9.18)	9.41 (9.14 – 9.68)	8.80 (8.55 – 9.05)	9.09 (8.91 – 9.27)
1st Two Years	13.57 (13.35 – 13.79)	12.84 (12.66 – 13.04)	13.16 (13.02 – 13.3)	11.73 (11.52 – 11.94)	11.65 (11.44 – 11.86)	11.69 (11.54 – 11.84)	11.91 (11.69 – 12.13)	11.21 (11.00 – 11.42)	11.55 (11.40 – 11.70)
1st Three Years	13.69 (13.51-13.87)	12.99 (12.83-13.15)	13.30 (13.18-13.42)	12.31 (12.13-12.49)	12.04 (11.86-12.22)	12.17 (12.04-12.30)	12.13 (11.95-12.31)	11.65 (11.41-11.89)	11.96 (11.81-12.11)
1st Four Years	13.37 (13.21-13.53)	12.77 (12.63-12.91)	13.04 (12.94-13.14)	12..08 (11.92-12.24)	11.90 (11.75-12.05)	11.99 (11.88-12.10)	12.22 (12.00-12.44)	-	-
Casualty Only:									
1st Year	5.63 (5.44 – 5.82)	5.32 (5.16 – 5.48)	5.45 (5.33 – 5.57)	3.90 (3.73 – 4.07)	3.54 (3.38 – 3.70)	3.72 (3.60 – 3.84)	3.71 (3.54 – 3.88)	3.62 (3.46 – 3.78)	3.66 (3.55– 3.77)
1st Two Years	6.87 (6.71– 7.03)	6.32 (6.19 – 6.45)	6.56 (6.46 – 6.66)	5.35 (5.21 – 5.49)	5.15 (5.01 – 5.29)	5.25 (5.15 – 5.35)	5.20 (5.06 – 5.34)	4.97 (4.83 – 5.11)	5.08 (4.98 – 5.18)
1st Three Years	7.30 (7.17-7.43)	6.67 (6.56-6.78)	6.95 (6.86-7.04)	5.39 (5.23-5.55)	5.66 (5.54-5.78)	5.77 (5.68-5.86)	5.57 (5.45-5.69)	5.39 (5.23-5.55)	5.51 (5.41-5.61)
1st Four Years	7.40 (7.28-7.52)	6.71 (6.61-6.81)	7.01 (6.93-7.09)	6.02 (5.91-6.13)	5.78 (5.67-5.89)	5.89 (5.81-5.97)	5.82 (5.67-5.97)	-	-
Material Damage:									
1st Year	12.71 (12.42 – 13.00)	12.07 (11.82 -12.32)	12.35 (12.16 – 12.54)	9.73 (9.46 – 10.00)	9.08 (8.83 – 9.33)	9.40 (9.22 – 9.58)	9.94 (9.67 – 10.21)	9.04 (8.79 – 9.29)	9.47 (9.29 – 9.65)
1st Two Years	15.23 (15.00 – 15.46)	14.39 (14.19- 14.59)	14.76 (14.61 – 14.91)	13.06 (12.83 – 13.29)	13.14 (12.92 – 13.36)	13.10 (12.94 – 13.26)	13.19 (12.96 – 13.42)	12.22 (12.00-12.44)	12.69 (12.53 – 12.85)
1st Three Years	16.07 (15.87-16.27)	15.32 (15.15-15.49)	15.65 (15.52-15.78)	14.32 (14.12-1452)	13.89 (13.70-14.08)	14.10 (13.96-14.24)	13.91 (13.71-14.11)	13.28 (13.02-13.54)	13.68 (13.52-13.84)
1st Four Years	16.31 (16.13-16.49)	15.75 (15.60-15.90)	16.00 (15.90-16.1)	14.47 (14.30-14.64)	14.14 (13.97-14.31)	14.30 (14.18-14.42)	14.37 (14.13-14.61)	-	-

Table 15 shows the New driver crash rates obtained when only the drivers who had advanced to the Novice stage were included in their calculation. As would be expected (by excluding drivers who remained in the low-risk, low-exposure Learner stage throughout the study period), the rates computed for these drivers were higher than those calculated for all New drivers (Table 14). As well, there was slightly more variability in the rates obtained for Pre-GLP drivers by intake year.

Table 15: New Driver Crash Involvement Rates (per 100 licensed driver-years) and 95% Confidence Intervals (CI) – by Intake Year, Program, and Years of Licensure – for Drivers who Advanced to the Novice stage during the Specified Period of Licensure

	Pre-GLP Intake Year			Early GLP Intake Year			Full GLP Intake Year		
	1996	1997	1996-1997	1999	2000	1999-2000	2001	2002	2001-2002
Crash Type by Years of Licensure	Rate (95% CI)	Rate (95% CI)	Average Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Average Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Average Rate (95% CI)
All Crashes:									
1st Year	23.90 (22.46–23.34)	20.88 (20.52 – 21.24)	21.74 (21.46 – 22.02)	18.21 (17.77 – 18.65)	18.82 (18.35 – 19.29)	18.50 (18.18 – 18.82)	18.92 (18.46–19.38)	18.40 (17.95– 18.85)	18.65 (18.33 – 18.97)
1st Two Years	23.80 (23.50 - 24.10)	22.56 (22.30 – 23.82)	23.10 (22.90 – 23.30)	21.26 (20.95 – 21.57)	21.76 (21.4 4– 22.08)	21.51 (21.29 – 21.73)	21.19 (20.87 – 21.51)	21.54 (21.21– 21.87)	21.36 (21.13 – 21.59)
1st Three Years	24.51 (24.24 – 24.76)	23.35 (23.13 – 23.57)	23.86 (23.69 – 24.03)	22.12 (21.87 – 22.39)	21.83 (21.58 – 22.08)	21.98 (21.80-22.16)	21.69 (21.43 – 21.95)	21.65 (21.29 – 21.01)	21.67 (21.46 -21.88)
1st Four Years	24.59 (24.37 – 24.81)	23.51 (23.32 – 23.70)	23.99 (23.84 – 24.14)	21.92 (21.70 – 22.14)	21.79 (21.57 – 22.01)	21.85 (21.70 – 22.00)	21.86 (21.55 – 22.17)	- -	- -
Liable Crashes:									
1st Year	15.05 (14.69–15.41)	13.84 (13.55 – 14.13)	14.36 (14.13 – 14.59)	12.32 (11.96 – 12.68)	12.84 (12.4 5– 13.23)	12.57 (12.31 – 12.83)	12.97 (12.59 – 13.35)	12.66 (12.29 – 13.03)	12.81 (12.54 – 13.08)
1st Two Years	14.57 (14.33 – 14.81)	13.96 (13.75 – 14.17)	14.23 (14.07 – 14.39)	13.47 (13.22 – 13.72)	13.76 (13.51 – 14.01)	13.62 (13.44 – 13.80)	13.68 (13.43 – 13.93)	13.96 (13.70 – 14.22)	13.81 (13.63 – 13.99)
1st Three Years	14.32 (14.12 – 14.51)	13.75 (13.58 – 13.92)	14.00 (13.87 – 14.13)	13.43 (13.23 – 13.63)	13.39 (13.19 – 13.59)	13.41 (13.27 – 13.55)	13.46 (13.25 – 13.67)	13.45 (13.17 – 13.73)	13.46 (13.29 – 13.63)
1st Four Years	13.84 (13.67 – 14.01)	13.35 (13.20 – 13.50)	13.56 (13.45 – 13.67)	12.87 (12.70 – 13.04)	12.97 (12.80 – 13.14)	12.92 (12.80 – 13.04)	13.19 (12.95 – 13.43)	- -	- -
Casualty Only:									
1st Year	7.03 (6.79–7.27)	6.39 (6.19 – 6.59)	6.66 (6.51 – 6.81)	5.11 (4.88 – 5.34)	5.20 (4.95 – 5.45)	5.15 (4.98 – 5.32)	5.11 (4.87 – 5.35)	5.27 (5.03 – 5.51)	5.19 (5.02– 5.36)
1st Two Years	7.39 (7.22– 7.56)	6.88 (6.74 – 7.02)	7.11 (7.00 – 7.22)	6.13 (6.00 – 6.30)	6.10 (5.93 – 6.27)	6.11 (5.99 – 6.23)	6.00 (5.81 – 6.15)	6.23 (6.05 – 6.41)	6.10 (5.98– 6.22)
1st Three Years	7.66 (7.52- 7.80)	7.08 (6.96 – 7.20)	7.34 (7.25 – 7.43)	6.41 (6.27 – 6.55)	6.30 6.16 – 6.44)	6.35 (6.25 – 6.45)	6.20 (6.06 – 6.34)	6.25 (6.06 – 6.44)	6.22 (6.11 – 6.32)
1st Four Years	7.67 (7.55 – 7.79)	7.01 (6.91 – 7.12)	7.30 (7.22 – 7.38)	6.41 (6.29 – 6.53)	6.30 (6.18 – 6.42)	6.35 (6.27 – 6.43)	6.30 (6.13 – 6.47)	- -	- -
Material Damage:									
1st Year	15.87 (15.50–16.24)	14.49 (14.19 – 14.79)	15.08 (14.85 – 15.31)	13.10 (12.7 3– 13.47)	13.62 (13.23 – 14.02)	13.35 (13.08 – 13.62)	13.80 (13.40 – 14.20)	13.13 (12.75 – 13.51)	13.46 (13.19 – 13.73)
1st Two Years	16.40 (16.15 – 16.65)	15.68 (15.46 – 15.90)	16.00 (15.83 – 16.17)	15.13 (14.86 – 15.40)	15.66 (15.39 – 15.93)	15.40 (15.21 – 15.59)	15.21 (14.94 – 15.48)	15.31 (15.03 – 15.59)	15.26 (15.07 – 15.45)
1st Three Years	16.85 (16.64 – 17.06)	16.27 (16.09 – 16.45)	16.52 (16.38 – 16.66)	15.72 (15.50 – 15.94)	15.53 (15.32 – 15.74)	15.63 (15.48 – 15.78)	15.48 (15.26 – 15.70)	15.40 (15.1 – 15.7)	15.45 (15.27 – 15.63)
1st Four Years	16.91 (16.73 – 17.09)	16.50 (16.34 – 16.66)	16.68 (16.56 – 16.80)	15.51 (15.32 – 15.70)	15.49 (15.31 – 15.67)	15.50 (15.37 – 15.63)	15.56 (15.30 – 15.82)	- -	- -

Table 16 summarizes the New driver crash rates obtained for GLP drivers who graduated to a Full Privilege licence during the specified period of licensure. These are the first drivers to complete all of the Learner and Novice stage requirements, including the final exit road test. As noted earlier, however, the rates obtained for these drivers may not be representative because they are based on incomplete groups (not everyone in the GLP 2001 and 2002 was able to complete three or four years of licensure by the study cut-off date), and on drivers who were motivated to move through GLP quickly. Consequently they might have higher levels of driving exposure than the other Novice drivers in their cohort groups. The likelihood of exposure issues is particularly apparent for drivers who obtained their Full Privilege licence before the end of their second year. The crash involvement rates for these GLP drivers are very high relative to the rates reported in Table for the GLP and Pre-GLP who had progressed to their first solo licence.

Table 16: New Driver Crash Involvement Rates (per 100 licensed driver-years) and 95% Confidence Intervals (CI) – by Intake Year, Program, and Years of Licensure – for GLP Drivers who Graduated to a Full Privilege Licence during the Specified Period of Licensure

	Early GLP Intake Year			Full GLP Intake Year		
	1999	2000	1999-2000	2001	2002	2001-2002
Crash Type by Years of Licensure	Rate (95% CI)	Rate (95% CI)	Average Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Average Rate (95% CI)
All Crashes:						
1st Two Years	28.77 (26.09 – 31.45)	31.76 (29.38 – 34.144	30.51 (28.73 – 32.29)	29.73 (27.92–31.54)	28.79 (27.27–30.31)	29.19 (28.03 – 30.35)
1st Three Years	26.08 (25.45 – 26.71)	25.82 (25.25– 26.39)	25.94 (25.52 – 26.36)	24.68 (24.19 – 25.17)	23.74 (23.09 – 24.39)	24.35 (23.96 – 24.74)
1st Four Years	25.41 (24.99 – 25.83)	25.00 (24.63 – 25.37)	25.19 (24.91 – 25.47)	23.87 (23.39 – 24.35)	- -	- -
Liable Crashes:						
1st Two Years	16.63 (14.59 – 18.67)	17.88 (16.09– 19.67)	17.36 (16.02 – 18.70)	16.73 (15.37 – 18.09)	17.30 (16.12 – 18.48)	17.06 (16.17 – 17.95)
1st Three Years	14.67 (14.20 – 15.14)	14.80 (14.37 – 15.23)	14.74 (14.42 – 15.06)	14.47 (14.09 – 14.85)	13.69 (13.19 – 14.19)	14.20 (13.90 – 14.50)
1st Four Years	14.15 (13.84 – 14.46)	14.10 (13.82– 14.38)	14.12 (13.91 – 14.33)	13.76 (13.39 – 14.13)	- -	- -
Casualty Only:						
1st Two Years	6.75 (5.45 – 8.05)	7.45 (6.30 – 8.60)	7.16 (6.30 – 8.02)	7.62 (6.70 – 8.54)	7.78 (6.99– 8.57)	7.71 (7.11– 8.31)
1st Three Years	6.79 (6.47 – 7.11)	6.89 (6.59– 7.19)	6.85 (6.63 – 7.07)	6.59 (6.33 – 6.85)	6.50 (6.16 – 6.84)	6.56 (6.36– 6.76)
1st Four Years	6.85 (6.63– 7.07)	6.81 (6.62– 7.00)	6.83 (6.69 – 6.97)	6.55 (6.30 – 6.80)	- -	- -
Material Damage:						
1st Two Years	22.02 (19.68– 24.36)	24.31 (22.22 – 26.40)	23.35 (21.79 – 24.91)	22.11 (20.55 – 23.67)	21.02 (19.72 – 22.32)	21.48 (20.48 – 22.48)
1st Three Years	19.29 (18.75 – 19.83)	18.93 (18.44– 19.42)	19.10 (18.74 – 19.46)	18.09 (17.67 – 18.51)	17.24 (16.68 – 17.80)	17.78 (17.44 – 18.12)
1st Four Years	18.56 (18.20 – 18.92)	18.19 (17.87– 18.51)	18.36 (18.12 – 18.60)	17.31 (16.90 – 17.72)	- -	- -

The detailed crash involvement rates reported in Tables 13 through 16 have been provided primarily for background information and to establish a context for future evaluations of GLPe. The most striking feature of the data shown in the tables is that, despite some year-to-year variation, the rates computed for GLP drivers are consistently lower than the rates computed for Pre-GLP drivers. Previously, it was not known to what

extent estimates of GLP effectiveness might vary depending upon which driver cohorts were included in the analysis. Although the amount of variability observed was relatively small, it is sufficient to warrant using only the average rates for each licensing program in the analysis of GLP impact, rather than those computed by intake year. Using the average rates will smooth out some of the variability and provide a more accurate estimate of the GLP program effect. Although the GLP rates could be aggregated across all four intake years, the distinction between the Early and Full program years was retained so that the incremental effects of full implementation could be assessed. The results of these analyses are detailed below.

4.2.4 Analysis of GLP Effects on New Driver Crash Involvement Rates

To evaluate the impact of GLP on New driver crash rates, several analyses were undertaken. Firstly, short- and long-term crash rates were compared by program (Pre-GLP, Early GLP, and Full GLP). All New drivers who had been licensed for the specified periods of time (1 year, 2 years, 3 years and 4 years) were included in these analyses, regardless of their rate of progression through the respective licensing stages. These analyses were conducted to obtain an overall estimate of the effectiveness of the program within a specified period of licensure. They do not, however, provide an estimate of the total program impact. As noted previously, even after four years of licensure many of the GLP New drivers had not progressed, or been exposed to, all of the components of GLP. Consequently, two further sets of analyses were undertaken: one to assess the impact of the program on drivers who had, at a minimum, passed their first road test and entered the Novice stage, and a second to estimate the impact of GLP on drivers who had been exposed to the full Novice stage component, had passed the exit test and graduated to a Full Privilege licence. The analyses were done in this hierarchical manner due to the dynamic nature of the licensing process, the length of time it takes drivers to move through GLP and the finding that, even after four years, only about 30% of the GLP cohorts had been exposed to all of the program components. By doing a staged analysis, it was possible to retain the majority of each cohort in the models designed to estimate the impact of the Learner and early Novice stage components, and reserving the small subset of program graduates for only those analyses designed to estimate the total program effect. Clearly, however, these latter analyses must be considered preliminary until a larger percentage of the drivers have completed the final road test and obtained their Full Privilege licence.

The short- and longer-term effects of GLP on New driver crash involvement rates were assessed in five steps:

- Firstly, Poisson regression models (see section 3.4) were used to compare the crude crash involvement rates of the GLP and Pre-GLP driver. Crude rates provide an estimate of the magnitude of a given event in a particular population at risk during a specified time period. They were used to assess the global effect of GLP on New driver crash rates, including any effect the program might have had on the age at which New drivers applied for their first Learner licence.

- Secondly, Poisson models were used to compare the crude rates of the New driver groups with those of experienced driver groups (see section 4.1.2). This was done to determine to what extent any changes observed in the New driver crash involvement rates over time might be attributable to factors other than GLP.

- Thirdly, Poisson models were used to compare the crash involvement rates of the GLP and Pre-GLP groups after adjustment for age and gender. This was done to determine to what extent the age and gender differences observed (section 4.2.1) between the GLP and Pre-GLP groups might be influencing the global effects detected with the analysis of the crude rates.

- Fourthly, the relative effects of the GLP Learner and Novice stages on New driver rates were assessed.

- Finally, the overall effects of GLP Learner stage components on Learner driver crash rates, the influence of completing an approved driver education course during the Learner stage, and the effect of performance on the enhanced knowledge and Class 7 (or 8) road tests were assessed.

Tables 17-19 summarize the results of the first set of the Poisson regression analyses done to compare the crude (unadjusted) crash involvement rates of the GLP and Pre-GLP groups. Table 17 shows the results when all drivers were included in the model; Table 18 shows the results when the analyses were restricted to drivers who obtained their Novice licence during the time period specified; and Table 19 shows the results for drivers who progressed through all of the GLP components and graduated to a Full Privilege licence in the specified period. In each analysis, the impact of study group membership (Full GLP, Early GLP, or Pre-GLP) was modelled for all crashes, liable ("at-fault") crashes only, casualty crashes, and material damage only crashes. Relative risks were computed using the Pre-GLP as the reference category for analyses involving all three program groups. Contrasts generated by the regression procedures were used to test for significant differences between the Full and Early GLP groups.

With the exception of the results shown in Table 19, GLP New drivers were found to have consistently lower crash involvement rates than Pre-GLP drivers, regardless of the specific GLP program to which they were exposed, or the type of crash included in the rate calculation. When all crashes and all drivers were included, the 1-year New driver crash involvement rates for GLP drivers were about 27% lower than the Pre-GLP rates, the 2-year rates were about 16-18% lower, the 3-year rates were about 12-15% lower, and the 4-year rates were about 12% lower. When the analyses included only those drivers who advanced to the Novice stage in the time period of interest, the1-year rates were about 14-15% lower for GLP compared to Pre-GLP drivers. The percentage reduction declined to about 9% for the comparison of 4-year rates.

The magnitude of the percentage differences observed in Table 17 between the Early and Full GLP New driver crash involvement rates were small, and the direction of the effect was inconsistent. Across all categories of crashes, no significant differences were observed for drivers in their first year of licensure. During the second and third years of licensure, however, significantly lower crash rates were obtained for the Full GLP group in several of the crash categories. Significant differences were not obtained, however, when the comparisons of the Early and Full GLP groups were repeated using only those drivers who advanced to the Novice stage during each period of licensure (Table 18). This suggests that the results shown in Table 17 were likely due to differences between the characteristics or exposures of the drivers who failed to progress beyond the Learner stage in the two groups, and not to the implementation of the final GLP components. In a later section of the evaluation, GLP implementation effect will be re-examined after the potentially confounding effects of age and gender differences between the groups have been taken into account.

The results of the analysis of GLP drivers who progressed through all components of the program during each period of licensure (GLP program graduates) are shown in Table 19. As can be seen, when comparing the rates of these drivers to those of the Pre-GLP drivers, the computed relative risks were all significantly greater than one. As mentioned earlier, however, to be included in these analyses, the GLP drivers had to move through the program fairly quickly. But fewer than 30% had graduated even after four years of licensure. . Until the majority of the GLP cohorts have graduated out of the program, the rates calculated for the program graduates will, like these, be based on those most motivated to progress through the system. It is possible that such motivated drivers would have been driving more, and perhaps under more risky conditions, than the drivers who remained in the Novice stage throughout their first four years of licensure. Unfortunately, there was no way to identify a similar group of highly motivated Pre-GLP drivers to include in the comparison. Therefore, the overall impact of GLP on New driver crash rates cannot yet be accurately assessed. Consequently, no further analyses of these drivers will be included in this evaluation.

Although the findings reported thus far are interesting and suggestive, it is possible that factors other than GLP could be influencing the results. For example, factors external to GLP, such as changes in road safety measures, socioeconomic, police enforcement, or other societal factors could influence crash rates over time. To explore this possibility, experienced driver rates were computed and compared to the New driver rates. The next section describes the results of these analyses.

Table 17: Relative Risks of Crash Involvement for All New Drivers (Rates shown in Table 14)

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Licensure When Crashes Occurred (by Study Group)	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year of Licensure								
Full GLP (2001-2002)	0.74 (0.72, 0.75)	**-26%***	0.77 (0.75, 0.79)	**-23%***	0.67 (0.65, 0.70)	**-33%***	0.77 (0.75, 0.79)	**-23%***
Early GLP (1999-2000)	0.74 (0.72, 0.75)	**-26%***	0.76 (0.74, 0.78)	**-24%***	0.68 (0.66, 0.71)	**-32%***	0.76 (0.74, 0.78)	**-24%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.00 (0.98, 1.02)	**0%**	1.01 (0.98, 1.04)	**+1%**	0.98 (0.94, 1.03)	**-2%**	1.01 (0.98, 1.04)	**+1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	0.83 (0.82, 0.85)	**-17%***	0.88 (0.86, 0.89)	**-12%***	0.78 (0.76, 0.79)	**-22%***	0.86 (0.85, 0.87)	**-14%***
Early GLP (1999 – 2000)	0.86 (0.85, 0.87)	**-14%***	0.89 (0.87, 0.90)	**-11%***	0.80 (0.78, 0.82)	**-20%***	0.89 (0.87, 0.90)	**-11%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.97 (0.95, 0.98)	**-3%***	0.99 (0.97, 1.01)	**-1%**	0.97 (0.95, 1.00)	**-3%**	0.97 (0.96, 0.99)	**-3%*****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	0.85 (0.84,0.86)	**-15%***	0.90 (0.89,0.91)	**-10%***	0.79 (0.78,0.81)	**-21%***	0.87 (0.86,0.89)	**-13%***
Early GLP (1999-2000)	0.88 (0.87,0.89)	**-12%***	0.92 (0.90,0.93)	**-8%***	0.83 (8.81,0.85)	**-17%***	0.90 (0.89,0.91)	**-10%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.0 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001-2002)	0.97 (0.95,0.98)	**-3%***	0.98 (0.97,1.00)	**-2%**	0.95 (0.93,0.98)	**-5%***	0.97 (0.96,0.98)	**-3%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Full GLP (2001)	0.88 (0.86,0.89)	**-12%***	0.94 (0.92,0.96)	**-6%***	0.83 (0.81,0.85)	**-17%***	0.90 (0.88,0.91)	**-10%***
Early GLP (1999 – 2000)	0.88 (0.87,0.88)	**-12%***	0.92 (0.91,0.93)	**-8%***	0.84 (0.83,0.86)	**-16%***	0.89 (0.88,0.90)	**-11%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001)	1.00 (0.98,1.02)	**-0%**	1.02 (1.00,1.04)	**2%**	0.99 (0.96,1.02)	**-1%**	1.00 (0.99,1.02)	**1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)		1.00 (REF)		1.00 (REF)	-

*P < 0.0001 **P < 0.001 ***P<0.01 [1]*CI=Confidence Interval*

Table 18: Relative Risks of Crash Involvement for New Drivers who Advanced to the Novice stage Within each Period of Licensure (Rates shown in Table 15)

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Licensure When Crashes Occurred (by Study Group)	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year of Licensure								
Full GLP (2001-2002)	0.86 (0.84, 0.88)	**-14%***	0.89 (0.87, 0.92)	**-11%***	0.78 (0.75, 0.81)	**-22%***	0.89 (0.87, 0.92)	**-11%***
Early GLP (1999-2000)	0.85 (0.83, 0.87)	**-15%***	0.88 (0.85, 0.90)	**-12%***	0.77 (0.74, 0.81)	**-23%***	0.89 (0.86, 0.91)	**-11%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.01 (0.98, 1.03)	**1%**	1.02 (0.99, 1.05)	**2%**	1.01 (0.96, 1.06)	**1%**	1.01 (0.98, 1.04)	**1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	0.92 (0.91, 0.94)	**-8%***	0.97 (0.95, 0.99)	**-3%****	0.86 (0.84, 0.88)	**-14%***	0.95 (0.94, 0.97)	**-5%***
Early GLP (1999 – 2000)	0.93 (0.92, 0.94)	**-7%***	0.96 (0.94, 0.97)	**-4%***	0.86 (0.84, 0.88)	**-14%***	0.96 (0.95, 0.98)	**-4%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.99 (0.97, 1.01)	**-1%**	1.01 (0.99, 1.03)	**2%**	1.00 (0.97, 1.03)	**0%**	0.99 (0.97, 1.01)	**-1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	0.91 (0.90,0.92)	**-9%***	0.96 (0.95,0.98)	**-4%***	0.85 (0.83,0.87)	**-15%***	0.94 (0.92,0.95)	**-7%***
Early GLP (1999-2000)	0.92 (0.91,0.93)	**-8%***	0.96 (0.94,0.97)	**-4%***	0.87 (0.84,0.85)	**-13%***	0.95 (0.93,0.96)	**-5%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001-2002)	0.99 (0.97,0.1.00)	**-1%**	1.00 (0.99,1.02)	**0%**	0.98 (0.96,1.00)	**-2%**	0.99 (0.97,1.00)	**-1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Full GLP (2001)	0.91 (0.90,0.93)	**-9%***	0.97 (0.95,0.99)	**-3%*****	0.86 (0.84,0.89)	**-14%***	0.93 (0.92,0.95)	**-7%***
Early GLP (1999 – 2000)	0.91 (0.90,0.92)	**-9%***	0.95 (0.94,0.96)	**-5%***	0.87 (0.85,0.88)	**-13%***	0.93 (0.92,0.94)	**-7%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001)	1.00 (0.98,1.02)	**0%**	1.02 (1.00,1.04)	**2%**	0.99 (0.96,1.02)	**-1%**	1.00 (0.99,0.102)	**0%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	

*P < 0.0001 **P < 0.001 ***P<0.05 [1]*CI=Confidence Interval*

Table 19: Relative Risks of Crash Involvement for GLP New Drivers who Advanced to the Full Privilege stage Within each Period of Licensure Compared to Pre-GLP New Drivers (Rates shown in Table 16)

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Licensure When Crashes Occurred (by Study Group)	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	1.26 (1.21, 1.31)	**26%***	1.20 (1.14, 1.26)	**20%***	1.08 (1.00, 1.17)	**9%**	1.34 (1.28, 1.41)	**34%***
Early GLP (1999 – 2000)	1.32 (1.24, 1.40)	**32%***	1.22 (1.13, 1.32)	**22%***	1.01 (0.89, 1.14)	**1%**	1.46 (1.36, 1.56)	**46%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.96 (0.89, 1.03)	**-4%**	0.98 (0.90, 1.08)	**-2%**	1.08 (0.94, 1.24)	**8%**	0.92 (0.85, 1.00)	**-8%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	1.02 (1.00, 1.04)	**2%**	1.01 (0.99, 1.04)	**1%**	0.89 (0.86, 0.92)	**-11%***	1.08 (1.05, 1.10)	**8%***
Early GLP (1999-2000)	1.09 (1.07, 1.11)	**9%***	1.05 (1.03, 1.08)	**5%***	0.93 (0.90, 0.97)	**-7%***	1.16 (1.13, 1.18)	**16%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.94 (0.92, 0.96)	**-6%***	0.96 (0.93, 0.99)	**-4%**	0.96 (0.92, 1.00)	**-4%**	0.93 (0.91, 0.96)	**-7%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Full GLP (2001)	0.99 (0.97, 1.02)	**-1%**	1.01 (0.99, 1.04)	**1%**	0.90 (0.86, 0.93)	**-10%***	1.04 (1.01, 1.06)	**4%*****
Early GLP (1999 – 2000)	1.05 (1.04, 1.06)	**5%***	1.04 (1.02, 1.06)	**4%***	0.93 (0.91, 0.96)	**-7%***	1.10 (1.08, 1.12)	**10%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001)	0.95 (0.93, 0.97)	**-5%***	0.98 (0.95, 1.01)	**-2%**	0.96 (0.92, 1.01)	**-4%**	0.95 (0.92, 0.97)	**-6%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-

*P < 0.0001 **P < 0.001 ***P<0.01 [1]*CI=Confidence Interval*

Comparison of New Driver and Experienced Driver Crash Involvement Rates. As mentioned previously, due to the province-wide implementation of GLP in 1998 it was not possible to identify concurrent comparison groups to use in the evaluation. Instead, historical groups were used (the Pre-GLP groups). When using such historical comparison groups, it is possible that any differences observed between the groups may be due to factors other than the program of interest – in this case GLP. Economic, social, road safety or other factors may have been influencing crash rates over the period of time included in the evaluation. In order to assess to what extent such factors may have been influencing the New driver crash rates described above, samples of experienced drivers were selected from each of the Pre-GLP and GLP intake years. The sample selection criteria for the experienced driver groups were described in section 4.1.2.

A total of 6,681,541 experienced drivers were selected for inclusion in the study with about 33% forming each of the 1996-1997 (n=2,252,224), 1999-2000 (n=2,212,718), and 2001-2002 (n=2,216,599) Pre-GLP and GLP time-matched comparison groups. One-year, two-year, three-year and four-year crash involvement rates were calculated for the experienced driver groups and these were compared to the one- through four-year crash involvement rates of the Pre-GLP and GLP New driver groups. For these analyses, ***per driver*** rates were used as licensed driver-time was not available for the experienced drivers. Although the New driver rates tended to decline as their periods of licensure increased, the experienced driver rates remained relatively stable (for example, the experienced driver group matched in time to the Early Pre-GLP group had total crash involvement rates that were between 12.50 and 13.00 regardless of the time frame used for the rate calculation. Thus, only the results of the analyses done using the four-year rates are shown in Table 20.

Table 20: Four-year Crash Involvement Rates[1], Relative Risks, and 95% Confidence Intervals (CI) for New and Experienced Drivers

	New Drivers			Experienced Drivers		
Crash Type by Study Group[2]	**Crash Rate (95% CI)**	**Relative Risk (95% CI)**	**% Difference (from REF Group)**	**Crash Rate[3] (95% CI)**	**Relative Risk (95% CI)**	**% Difference (from REF Group)**
All Crashes						
Full GLP (2001)	17.73 (17.48-17.98)	0.93 (0.91,0.94)	**-7%***	12.67 (12.64-12.70)	1.05 (1.04,1.05)	**+5%***
Early GLP (1999 – 2000)	18.04 (17.91-18.17)	0.94 (0.94,0.95)	**-6%***	12.60 (12.58-12.62)	1.04 (1.04,1.04)	**+4%***
Pre-GLP (1996 – 1997)	19.10 (18.98-19.22)	1.00 (REF)	-	12.12 (12.10-12.24)	1.00 (REF)	-
Liable Only						
Full GLP (2001)	10.72 (10.53-10.91)	0.99 (0.97,1.01)	**-1%**	5.48 (5.46-5.50)	1.08 (1.07,1.08)	**+8%***
Early GLP (1999 – 2000)	10.71 (10.61-10.81)	0.99 (0.98,1.00)	**-1%**	5.36 (5.34-5.38)	1.05 (1.05,1.06)	**+5%***
Pre-GLP (1996 – 1997)	10.82 (10.73-10.91)	1.00 (REF)	-	5.08 (5.07-5.09)	1.00 (REF)	-
Casualty Only						
Full GLP (2001)	5.11 (4.98-5.24)	0.88 (0.85,0.90)	**-12%***	3.08 (3.06-3.10)	0.97 (0.96,0.98)	**-3%***
Early GLP (1999 – 2000)	5.26 (5.19-5.33)	0.90 (0.89,0.92)	**-10%***	3.11 (3.10-3.12)	0.98 (0.97,0.98)	**-2%***
Pre-GLP (1996 – 1997)	5.82 (5.76-.88)	1.00 (REF)	-	3.18 (3.17-3.19)	1.00 (REF)	-
Material Damage Only						
Full GLP (2001)	12.62 (12.41-12.83)	0.95 (0.93,0.97)	**-5%***	9.60 (9.57-9.63)	1.07 (1.07,1.08)	**+7%***
Early GLP (1999 – 2000)	12.77 (12.66-12.88)	0.96 (0.95,0.97)	**-4%***	9.48 (9.46-9.50)	1.06 (1.06,1.06)	**+6%***
Pre-GLP (1996 – 1997)	13.28 (13.18-13.38)	1.00 (REF)	-	8.94 (8.92-8.96)	1.00 (REF)	-

*P < 0.0001 **P < 0.001 ***P<0.05

[1] Rates were calculated per 100 drivers (licensed driver-time was not available for the experienced driver groups).

[2] Study group membership was defined by the year in which New drivers obtained their Learner licence. Experienced drivers were time-matched to the study groups using their birth date, rather than a licence issue date, as their intake date.

The data in Table 20 show that, in contrast to the pattern observed for the comparison of the New driver groups (GLP drivers having *lower* crash involvement rates than Pre-GLP drivers), both of the GLP time-matched Experienced driver groups had *higher* crash rates than the Pre-GLP time-matched group - in every category of crashes except that involving casualty crashes. And even for casualty crashes, the differences between the rates observed for the GLP to Pre-GLP comparisons were larger (by 8-9 percentage points) than those observed between the relevant Experienced driver groups. These results suggest that although there may have been some influence of factors other than GLP on the casualty crash rates of New drivers, the effects of such factors would have been small and in most cases would likely have had a negative rather than positive effect on the observed New driver rates. Therefore, to the extent that the experienced driver crash involvement rates are a valid indicator of the influence of these other factors, it can be concluded that they have not played an important role in contributing to the reductions in the crash rates observed for GLP New drivers relative to the Pre-GLP comparison group.

In the next section, two other factors that could influence the results of comparisons between GLP and Pre-GLP crash rates are examined: age at licensure and gender. As noted previously, both age and gender are known risk factors for collisions, with males and younger drivers tending to have higher crash rates than older and female drivers. Although most of the drivers in both the GLP and Pre-GLP cohorts are young drivers (aged 16 to 24), a higher percentage of drivers obtained their Learner licence at the age of 16 in the GLP cohorts, and a higher percentage of drivers obtained their Learner licence when they were over 24 in the Pre-GLP cohorts. Likewise, the GLP cohorts had slightly higher percentages of males than females. Due to their strong associations with crash involvement, these differences in the age and gender distributions could be attenuating the estimated GLP effect. Therefore, even though the shifts observed in the age and gender distributions could be unintended negative consequences associated with the implementation of GLP (in the sense that GLP is prompting more young males to obtain their licences sooner than they might have if GLP had not been implemented), it is important to exclude their effect in order to estimate more precisely the impact of the GLP program components.

Age and Gender Effects on New Driver Crash Involvement Rates. Table 21 shows the estimated relative risks (and their 95% confidence intervals) for the short-term and longer-term New driver crash involvement rates after adjustment for differences between the driver cohorts in their age and gender distributions. As anticipated, adjusting for age and gender differences between the groups enhanced the GLP effect. For example, before adjustment, when all crashes were included in the analysis, the GLP groups were found to have crash involvement rates that were about 26% lower during their first year of licensure than the Pre-GLP comparison group and about 12% lower during the first four years of licensure. After adjustment, these same comparisons resulted in estimated rates that were 32% lower for GLP drivers during their first year of licensure and about 17-18% lower during their first four years of licensure. This suggests that about 5% of the overall GLP effect was being masked by the confounding influence of age and gender differences between the study groups.

The results presented in Table 21 were based on the inclusion of all of the drivers in each cohort, regardless of their progression through the licensing process. As discussed in the previous section, however, an important aim of this evaluation is to estimate the impact that GLP has on the crash rates of drivers who have been exposed to all of the program elements. Unfortunately, at the time the study was undertaken, fewer than 30% of the GLP drivers had progressed beyond the Novice stage to Full privilege licensure (Table 6). Consequently, it was not possible to assess the full impact of GLP on New driver crash rates. However an analysis was undertaken to assess the impact of GLP on the crash involvement rates of drivers who had at least progressed to the Novice stage (some of whom would also have obtained their Full Privilege licence during the specified periods of licensure). Table 22 shows the results of these analyses.

Table 21: Estimate Age and Gender-Adjusted Relative Risks of Crash Involvement for All New Drivers by Period of Licensure

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Licensure When Crashes Occurred (by Study Group)	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st 1 Year of Licensure								
Full GLP (2001-2002)	0.68 (0.67, 0.70)	**-32%***	0.70 (0.68, 0.72)	**-34%***	0.62 (0.59, 0.64)	**-38%***	0.71 (0.69, 0.73)	**-29%***
Early GLP (1999-2000)	0.68 (0.67, 0.70)	**-32%***	0.69 (0.67, 0.71)	**-31%***	0.63 (0.60, 0.65)	**-37%***	0.70 (0.69, 0.72)	**-30%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.00 (0.98, 1.03)	**0%**	1.01 (0.98, 1.04)	**+1%**	0.98 (0.94, 1.03)	**-2%**	1.01 (0.98, 1.04)	**+1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	0.78 (0.77, 0.79)	**-22%***	0.81 (0.79, 0.82)	**-19%***	0.72 (0.70 0.74)	**-28%***	0.80 (0.79, 0.82)	**-20%***
Early GLP (1999 – 2000)	0.81 (0.80, 0.82)	**-19%***	0.82 (0.80, 0.83)	**-18%***	0.75 (0.73, 0.77)	**-25%***	0.83 (0.82, 0.85)	**-17%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.97 (0.95, 0.98)	**-3%***	0.99 (0.97, 1.00)	**-1%**	0.96 (0.94, 0.99)	**-4%****	0.97 (0.95, 0.98)	**-3%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	0.80 (0.79,0.81)	**-20%***	0.83 (0.82,0.84)	**-17%***	0.73 (0.72,0.75)	**-26%***	0.82 (0.81,0.83)	**-18%***
Early GLP (1999-2000)	0.83 (0.82,0.84)	**-17%***	0.85 (0.84,0.86)	**-15%***	0.78 (0.76,0.79)	**-22%***	0.85 (0.84,0.86)	**-15%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001-2002)	0.97 (0.95,0.97)	**-4%***	0.98 (0.96,0.99)	**-2%****	0.95 (0.93,0.97)	**-5%***	0.97 (0.95,0.98)	**-3%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Full GLP (2001)	0.82 (0.81,0.84)	**-18%***	0.87(0.85,0.88)	**-13%***	0.77 (0.76,0.80)	**-22%***	0.84 (0.83,0.86)	**-16%***
Early GLP (1999 – 2000)	0.83 (0.82,0.84)	**-17%***	0.86 (0.85,0.87)	**-14%***	0.79 (0.78,0.81)	**-20%***	0.84 (0.84,0.86)	**-15%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001)	0.99 (0.98,1.01)	**-1%**	1.01 (0.99,1.02)	**1%**	0.98 (0.95,1.01)	**-2%**	1.00 (0.98,1.01)	**0%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-

*P < 0.0001 **P < 0.005 [1]*CI = Confidence Interval*

Table 22: Estimated Age- and Gender-Adjusted Relative Risks of Crash involvement for New Drivers who Advanced to the Novice Stage within each Period of Licensure

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Licensure When Crashes Occurred (by Study Group)	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year of Licensure								
Full GLP (2001-2002)	0.80 (0.78, 0.82)	**-20%***	0.81 (0.79, 0.83)	**-19%***	0.72 (0.69, 0.75)	**-28%***	0.83 (0.81, 0.86)	**-17%***
Early GLP (1999-2000)	0.80 (0.78, 0.82)	**-20%***	0.80 (0.77, 0.82)	**-20%***	0.72 (0.69, 0.75)	**-28%***	0.83 (0.81, 0.86)	**-17%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.00 (0.98, 1.03)	**0%**	1.00 (0.98, 1.04)	**0%**	1.00 (0.95, 1.05)	**0%**	1.00 (0.97, 1.03)	**0%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	0.87 (0.85, 0.88)	**-13%***	0.89 (0.87, 0.91)	**-11%***	0.80 (0.78, 0.82)	**-20%***	0.90 (0.88, 0.91)	**-10%***
Early GLP (1999 – 2000)	0.88 (0.87, 0.89)	**-12%***	0.88 (0.87, 0.90)	**-12%***	0.81 (0.79, 0.83)	**-19%***	0.91 (0.90, 0.93)	**-9%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.98 (0.97, 1.00)	**-2%****	1.01 (0.99, 1.03)	**+1%**	0.99 (0.96, 1.02)	**-1%**	0.98 (0.97, 1.00)	**-2%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	0.85 (0.84,0.86)	**-17%***	0.89 (0.87,0.90)	**-11%***	0.79 (0.78,0.81)	**-21%***	0.88 (0.87,0.89)	**-12%***
Early GLP (1999-2000)	0.87 (0.86,0.88)	**-13%***	0.89 (0.88,0.90)	**-11%***	0.82 (0.80,0.83)	**-18%***	0.90 (0.89,0.91)	**-10%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001-2002)	0.98 (0.97,0.99)	**-2%****	1.00 (0.98,1.01)	**0%**	0.97 (0.95,0.99)	**-3%****	0.98 (0.97,1.00)	**-2%****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Full GLP (2001)	0.86 (0.85,0.87)	**-14%***	0.90 (0.88,0.92)	**-10%***	0.81 (0.79,0.83)	**-19%***	0.88 (0.86,0.90)	**-12%***
Early GLP (1999 – 2000)	0.87 (0.86,0.87)	**-14%***	0.89 (0.88,0.90)	**-11%***	0.82 (0.81,0.84)	**-18%***	0.88 (0.87,0.89)	**-12%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001)	0.99 (0.98,1.01)	**-1%**	1.01 (0.99,1.03)	**1%**	0.98 (0.96,1.01)	**-2%**	1.00 (0.98,1.04)	**-0%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-

*P < 0.0001 ** P<0.05 [1] *CI = Confidence Interval*

The results shown in Tables 21 and 22, in combination with the findings of the comparison to Experienced driver crash rates, and the analysis of unadjusted New driver rates (Tables 17 and Table 18), suggest three things: 1) that GLP had a strong and positive impact on the crash rates of New drivers, 2) that the effect remained, although its magnitude was reduced, when the analyses were restricted to drivers who progressed to the Novice stage during each period of licensure, and 3) that about 5-6% of the estimated size of the GLP program effect was attributable to the higher percentage of young male drivers in the GLP cohorts.

With respect to the comparison of the Full and Early GLP program, the estimated relative risks for the first two and three years of licensure were found to be significantly lower (by about 2-5%) for the Full GLP group when all New drivers were included in the analyses (Table 21). The effects disappeared or were reduced in magnitude when only those drivers who advanced to the Novice stage were included (Table 22). No significant differences were found for either group during the first year of licensure or first four years of licensure. As the primary components added at the end of 2000 were the enhanced knowledge and Class 7 (and 8) road tests, it is possible that the effects may be more pronounced when the analyses are examined by stage of licensure (Learner and Novice stages analysed separately). However, the lack of an effect during the first year of licensure suggests that the implementation of the enhanced knowledge test may have had a limited impact. Nonetheless, the findings reported here may be confounded by the inclusion of drivers who obtained their Novice licence during this period. Similarly, to determine whether the addition of the level 1 road test had an impact it is important to examine the crash rates of Novice drivers alone.

Relative Impact of the GLP Learner and Novice Stage Conditions and Restrictions on GLP New Driver Crash Rates. In the previous section the impact of GLP on the short- and longer-term crash involvement rates of all New drivers was examined. All of the New driver crash involvements occurring within the first four years of licensure were used to compute and compare crash rates across the study groups. No distinction was made based on whether a crash occurred while a driver held a Learner or Novice[4] licence. As was shown in Table 7, however, the percentage of time spent in the Learner stage was much higher for GLP drivers than for Pre-GLP drivers. And, although the percentage of Learner-time did decline over time, it remained higher for GLP drivers throughout their first four years of licensure.

Given this imbalance in Learner-time it would be expected that New drivers' experiences during the Learner stage would have more of an influence on GLP New driver crash rates than on Pre-GLP rates. The extent of the effect is reflected in Table 23 which shows the association between the length of time drivers spent in the Learner stage and the New driver crash involvement rates observed in each period of licensure. The observed relationship is strong and negative indicating that the more time New drivers spend in the supervised Learner stage, the less likely they are to be involved in a crash. This is not a surprising result. It is mandatory for Learner drivers to be accompanied by a supervising adult at all times. Consequently, the Learner stage tends to be a time when New drivers are at a low risk of crash involvement. This is exemplified in Table 24 which shows the Learner driver crash rates, by program, for New drivers who graduated to the Novice stage within their first four years of licensure. The magnitudes of the Learner crash rates are much smaller than the New driver rates shown in Table 14, and the difference is even more dramatic when compared to the Novice crash rates shown in Table 24. The low risk associated with the Learner stage is one of the main reasons the minimum period was extended with the introduction of GLP and then further extended with GLPe.

[4] For the purposes of these analyses, GLP and Pre-GLP Novice driver crash rates were computed using crashes that occurred after the drivers obtained their first solo licence. For GLP drivers, some of these crashes occurred after they obtained their Full Privilege licence. Due to the small percentage of GLP New drivers who progressed to Full Privilege licensure during the study period, no separate analysis of GLP Novice and Full Privilege crash rates was included here.

Table 23: Percentage Change in New Driver Crash Involvement Rates by the Number of Months Spent in the Learner Stage - for Drivers who Advanced to the Novice Stage within each Period of Licensure

Period of Licensure	Length of Learner Stage	% Change in Crash Involvement Rate (from Reference Group)
First Year of Licensure (All New Driver Crash Involvements)	9 months or more 6 - <9 months 3 - <6 months less than 3 months	-76%* -43%* -17%* (Ref)
First Two Years of Licensure (All New Driver Crash Involvements)	18 months or more 12 - <18months 9 - <12 months 6 - <9 months 3 - <6 months less than 3 months	-78%* -55%* -43%* -22%* -9%* (Ref)
First Three Years of Licensure (All New Driver Crash Involvements)	24 months or more 18 -24 months 12 - <18months 9 - <12 months 6 - <9 months 3 - <6 months less than 3 months	-73%* -57%* -42%* -35%* -19%* -10%* (Ref)
First Four Years of Licensure (All New Driver Crash Involvements)	24 months or more 18 -24 months 12 - <18months 9 - <12 months 6 - <9 months 3 - <6 months less than 3 months	-63%* -47%* -35%* -30%* -16%* -10%* (Ref)

Interestingly, as shown in Table 24, the Novice crash rates obtained for GLP drivers during each of the periods examined were higher than those obtained for the comparison group of Pre-GLP drivers. It should be noted, however, that just as GLP drivers spent more of each period of licensure in the Learner stage, they spent less time in the Novice stage. It is well known that New drivers are at their highest risk of crash involvement during the first few months of unsupervised driving (Wiggins, 2004; Mayhew, et. al., 2003). Over time, the risk begins to decline as the drivers gain experience and maturity. Consequently, the GLP Novice rates shown in Table 24 may simply reflect that GLP Novice drivers spent less of their total period of licensure in the Novice stage and were, therefore still at a greater risk of crash involvement than their Pre-GLP counterparts. In chapter 5, this possibility is explored further by examining the crash involvement rates of GLP and Pre-GLP drivers matched on Novice driver-time, rather than on total driver-time.

Table 24: Learner and Novice Driver Crash Involvement Rates[1] (per 100 licensed years) for New Drivers who Advanced to the Novice stage within each Period of Licensure

Crash Type by Licence Stage and Years of Licensure	Pre-GLP 1996-1997	Early GLP 1999-2000	Full GLP 2001-2002
LEARNER STAGE:			
All Crashes:			
1st Year	4.36 (4.14-4.58)	3.19 (3.01-3.37)	3.32 (3.14-3.50)
1st Two Years	4.26 (4.05-4.45)	3.18 (3.04-3.32)	3.22 (3.07-3.37)
1st Three Years	4.26 (4.07-4.45)	3.14 (3.01–3.27)	3.26 (3.09-3.43)
1st Four Years	4.26 (4.07-4.45)	3.12 (2.99–3.25)	3.53 (3.25-3.81)
Liable Crashes:			
1st Year	2.65 (2.60-2.68)	1.96 (1.92-2.00)	2.05 (2.01-2.09)
1st Two Years	2.64 (2.61-2.67)	2.00 (1.97 2.03)	2.00 (1.97-2.03)
1st Three Years	2.65 (2.63–2.67)	2.01 (1.99-2.03)	2.02 (2.00–2.04)
1st Four Years	2.65 (2.63–2.67)	1.99 (1.97-2.01)	2.19 (2.15–2.23)
Casualty Crashes:			
1st Year	1.27 (1.15-1.39)	0.86 (0.77-0.95)	0.86 (0.77-0.95)
1st Two Years	1.26 (1.15–1.37)	0.90 (0.82–0.98)	0.86 (0.78-0.94)
1st Three Years	1.26 (1.15-1.37)	0.91 (0.84-0.98)	0.86 (0.77-0.95)
1st Four Years	1.26 (1.15-1.37)	0.91 (0.84-0.98)	1.02 (0.87-1.17)
Material Damage Only Crashes:			
1st Year	3.09 (2.91-3.27)	2.33 (2.18-2.48)	2.45 (2.29-2.61)
1st Two Years	3.00 (2.84-3.16)	2.28 (2.16–2.40)	2.36 (2.23-2.49)
1st Three Years	3.00 (2.84–3.16)	2.23 (2.12-2.34)	2.37 (2.23-2.51)
1st Four Years	3.00 (2.84–3.16)	2.21 (2.10-2.32)	2.51 (2.27-2.75)
NOVICE STAGE:			
All Crashes:			
1st Year	30.36 (29.96-30.76)	38.67 (37.96-39.38)	38.34 (37.64-39.04)
1st Two Years	27.49 (27.25-27.73)	31.75 (31.41-32.09)	30.48 (30.16-30.82)
1st Three Years	26.80 (26.61-26.99)	29.00 (28.76-29.24)	27.50 (27.23-27.77)
1st Four Years	26.16 (26.00-26.32)	27.02 (26.83-27-21)	26.27 (25.89-26.65)
Liable Crashes:			
1st Year	20.16 (19.83-20.49)	26.76 (26-17-27.35)	26.63 (26.05-27.21)
1st Two Years	16.92 (16.73-17.11)	20.10 (19.83-20.37)	19.76 (19.49-20.03)
1st Three Years	15.70 (15.56-15.84)	17.66 (17.47-17.85)	17.08 (16.87-17.29)
1st Four Years	14.77 (14.65-14.89)	15.93 (15.78-16.08)	15.83 (15.54-16.12)
Casualty Crashes:			
1st Year	9.34 (9.12-9.56)	10.88 (10.50-11.26)	10.75 (10.38-11.12)
1st Two Years	8.47 (8.34-8.60)	9.02 (8.84-9.20)	8.74 (8.56-8.92)
1st Three Years	8.25 (8.15-8.35)	8.38 (8.25-8.51)	7.91 (7.76-8.06)
1st Four Years	7.97 (7.88-8.06)	7.85 (7.75-7.95)	7.57 (7.37-7.77)
Material Damage Only Crashes:			
1st Year	21.02 (20.68-21.36)	28.08 (27.48-28.68)	27.59 (27.00-28.18)
1st Two Years	19.02 (18.82-19.22)	22.73 (22.44-23.02)	21.75 (21.47-22.03)
1st Three Years	18.55 (18.39-18.71)	20.62 (20.42-20.82)	19.59 (19.36-19.82)
1st Four Years	18.18 (18.05-18.31)	19.16 (19.00-19.32)	18.70 (18.38-19.02)

[1] *Rates were calculated as the number of Learner, or Novice, crashes divided by the amount of licensed Learner, or Novice, licensed-years accumulated during each period of licensure.*

4.2.5 GLP Effects on Learner Crash Involvement Rates

In this section, the effectiveness of the GLP Learner stage components and of the full implementation of GLP (which included the enhanced knowledge and Class 7 and 8 road tests) on Learner crash involvement rates are examined. As mentioned above, due to the need to time match the amount of Novice licensure to ensure more equal levels of risk, the evaluation of the effectiveness of the GLP Novice stage components will be presented in chapter 5.

Table 25 shows the results of the Poisson regression analyses undertaken to assess the impact of the GLP Learner stage components on Learner driver crash rates. For these analyses only those drivers who advanced to the Novice stage (i.e., who completed all of the Learner stage components including their first road test) during the specified period of licensure were included. As well, only the results obtained after adjustment for the known confounders of age- and gender are presented.

The relative risk ratios shown in Table 25 indicate that, after controlling for age and gender differences between the groups, GLP Learner drivers had crash rates that were consistently lower than those of Pre-GLP Learners and the difference was statistically significant in almost every category examined. GLP Learners who advanced to the Novice stage within their first year of licensure had Learner crash rates that were from 8% to 24% lower than their Pre-GLP counterparts; and GLP Learners who advanced to the Novice stage within their first two years of licensure had Learner crash rates that were from 14% to 26% lower than their Pre-GLP counterparts.

The comparison of Early to Full GLP Learner crash rates provided no clear evidence to suggest that the effectiveness of GLP improved after the addition of the enhanced knowledge and Class 7 (or 8) road tests (the main components added at the end of 2000). Across most categories of crashes and timelines, Learner drivers in the Full GLP group had slightly higher crash rates than those in the Early GLP group. However, none of the differences were statistically significant.

Learner Drivers and the Enhanced Knowledge and Level 1 Road Test. The analyses described above provided no evidence that full implementation of GLP, including the introduction of the enhanced knowledge and class 7 and 8 road tests, was associated with lower crash involvement rates for GLP Learner drivers. Although it is probably not surprising that no particular road safety benefit was found to be associated with the introduction of the Class 7 (or 8) road test (since it comes at the end of the Learner stage), a positive association might have been anticipated from the introduction of the enhanced knowledge test – at least during the first year of licensure. Knowledge tests are generally designed to assess knowledge and awareness of the rules of the road and basic standards of road safety. The old test (taken by the Early GLP group) consisted of 20 multiple-choice questions, many of which were taken verbatim from the driver guides. The enhanced test was designed to be more closely aligned with the goals of GLP and, although based on information in the guide, did not extract items verbatim. It was designed to emphasize the 'thinking driver'. The new Class 7 knowledge test contains 50 multiple-choice questions; the Class 8 test contains 40 items. Internal consistency measures were computed during field trials of the test and were found to be 0.84 for the Class 7 test items and 0.83 for the Class 8 items. A report summarizing the development of the knowledge test and describing the field trials is included in Appendix A. No attempt was made in the field trials to assess whether the new test had more predictive validity for Learner driver crash involvements than the old test. However, the results obtained in this study suggest that passing the knowledge test is not predictive for crashes. This does not mean that it has no predictive validity. It only indicates that it does not appear to predict crash involvement. It may predict 'thinking drivers' but this was not assessed.

Table 25: Estimated Age and Gender- Adjusted Relative Risks of Learner Crash Involvement for Drivers who Advanced to the Novice stage within each Period of Licensure

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Licensure When Crashes Occurred (by Study Group)	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year of Licensure								
Full GLP (2001-2002)	0.87 (0.80, 0.94)	**-13%****	0.86 (0.78, 0.94)	**-14%***	0.76 (0.66, 0.88)	**-24%****	0.91 (0.83, 1.00)	**-9%**
Early GLP (1999-2000)	0.85 (0.79, 0.92)	**-15%***	0.84 (0.76, 0.92)	**-16%***	0.77 (0.67, 0.90)	**-23%****	0.88 (0.80, 0.96)	**-12%**
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.02 (0.94, 1.10)	**2%**	1.03 (0.93, 1.13)	**3%**	0.98 (0.84, 1.14)	**-2%**	1.04 (0.95, 1.14)	**4%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	0.85 (0.79, 0.91)	**-15%***	0.83 (0.76, 0.91)	**-17%***	0.77 (0.67, 0.87)	**-23%***	0.88 (0.82, 0.96)	**-12%*****
Early GLP (1999 – 2000)	0.85 (0.79, 0.90)	**-15%***	0.85 (0.78, 0.92)	**-15%***	0.81 (0.72, 0.92)	**-19%***	0.86 (0.79, 0.93)	**-14%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.00 (0.94, 1.07)	**0%**	0.98 (0.90, 1.07)	**-2%**	0.94 (0.83, 1.07)	**-6%**	1.02 (0.94, 1.10)	**2%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	0.85 (0.79, 0.91)	**-15%***	0.83 (0.76, 0.91)	**-17%***	0.78 (0.69, 0.89)	**-22%****	0.88 (0.81, 0.95)	**-12%*****
Early GLP (1999-2000)	0.82 (0.77, 0.88)	**-18%***	0.83 (0.77, 0.90)	**-17%***	0.81 (0.72, 0.91)	**-19%****	0.83 (0.77, 0.89)	**-17%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.03 (0.96, 1.10)	**3%**	1.00 (0.92, 1.09)	**-0%**	0.97 (0.85, 1.09)	**-3%**	1.06 (0.98, 1.14)	**6%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Full GLP (2001)[2]	0.91 (0.82,1.00)	**-9%**	0.89 (0.79,1.00)	**-11%**	0.89 (0.74,1.05)	**-12%**	0.92 (0.82,0.103)	**-8%**
Early GLP (1999 – 2000)	0.81 (0.76,0.86)	**-19%***	0.81 (0.76,0.88)	**-18%***	0.80 (0.71,0.90)	**-20%***	0.81 (0.76,0.88)	**-19%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
Contrast:								
Full GLP (2001)[2]	1.12 (1.02, 1.22)	**12%**	1.09 (0.97, 1.22)	**9%**	1.11 (0.93, 1.30)	**11%**	1.13 (1.01, 1.25)	**13%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-

*P < 0.0001 **P < 0.001 ***P<0.01 [1] *CI = Confidence Interval* [2]*Small sample size*

A second question of interest for the evaluation was to what extent performance on the knowledge test may have influenced the crash rates of drivers in the Learner stage? Were drivers who passed the test on the first or second attempt more or less likely to be crash-involved once they obtained their Learner's licence? Unfortunately, due to system changes that were made when the enhanced knowledge test was introduced (Release 2.2) it was not possible to compare performance on the old and new test. The number of attempts taken to pass the test was only available for drivers who took the enhanced test. Thus, the analysis described below does not provide insights into the relative merits of the old versus the new test. However it does permit an exploration of relationships between performance on the test and crash involvements among Learner drivers.

To determine whether Learner crash involvement rates were associated with test performance a Poisson regression analysis was undertaken. Drivers were categorized according to whether they passed the knowledge test on the first attempt, second attempt, or whether it took them three or more attempts to pass. For these analyses, only the crashes that occurred during the first year of Learner driving were included. All Learner crashes were used regardless of liability or severity. Age and gender were included in the regression model to take into account their potentially confounding effects.

A total of 107,122 drivers from the Full GLP Learner cohort were used in the analysis. All of these drivers took the Class 7 Knowledge test. A further 185 completed the Class 8 test but, due to the small numbers, were excluded from the analysis. Of the drivers included, 57,516 (53.7%) passed the knowledge test on the first attempt, 29,070 (27.1%) passed on the second attempt, and the remaining 20,536 (19.2%) took three or more attempts. The range of attempts was from 1 to 29, with 286 people taking 10 or more attempts to pass.

After adjustment for age and gender, it was found that drivers who passed on the first attempt, or on the second attempt, had Learner crash involvement rates that were significantly lower ($P<0.001$) lower than the rate estimated for drivers who took three or more attempts. The estimated relative risks and their 95% confidence intervals were 0.79 (0.69, 0.91) and 0.76 (0.65, 0.89), respectively. Only crashes that occurred during the Learner stage in the drivers' first year of licensure were used in the analysis. Similar results were obtained whether all Learner crashes were used, Learner liable crashes only, Learner casualty crashes or material damage only crashes.

Although interesting, these findings are simply associations. It is not possible at this point to conclude that the ease with which drivers pass the knowledge test is causally related to their involvement in crashes during the Learner stage. Many other factors may explain the association. There could be socio-cultural issues, socio-economic issues, or exposure issues – to name a few. More research will be required to understand the mechanisms and factors that may be contributing to the identified association.

One of the potentially confounding factors that will be explored in this study is participation in an approved driver education course. This factor was not included in the regression models described above. But, if found to be associated with the crash risks of Learner drivers and with their performance on the knowledge test (in the sense that more drivers who did well or poorly on the knowledge test participated in the course), it could be a factor influencing the results reported above. Possible associations between performance on the knowledge test, completion of an ICBC approved driver education course, and Learner driver crash rates will be explored further below.

ICBC-Approved Driver Education and the Crash Involvement Rates of Learner Drivers. Although not a true component of GLP, the ICBC-approved driver education course was developed and implemented concurrently with GLP and plays an important role in the driver licensing process. It is also intrinsically linked with GLP as a result of the incentive used to promote participation in the course; drivers who complete the course, and submit a declaration of completion (DOC) to ICBC, become eligible to attempt their level 1 road test and exit the Learner stage up to three months sooner than other GLP Learner drivers.

Relationships between the approved driver education course, early Novice licensure, and the crash rates of Novice drivers will be examined in more detail in the next section of this report (chapter 5). Here, attention is limited to an exploration of relationships between performance on the knowledge test, participation in an approved driver education course and Learner crash involvement rates in the first year of licensure. In essence, the analysis is attempting to investigate whether there is any evidence of self-selection into the course based on knowledge test performance.

Approximately 31% (43,117) of the 138,770 Learner drivers who advanced to the Novice stage within their first year of licensure submitted a DOC and applied for early Novice licensure. Table 26 shows the estimated relative risks of Learner crash involvement for these drivers when compared to those who did not submit a DOC. The relative risks shown in Table 26 were obtained after taking into account the effects of age, gender, and the particular version of the GLP program to which the drivers were exposed (Early versus Full). As can be seen, the estimated relative risks are significantly greater than one indicating a higher rate of crash involvement for DOC Learner drivers than No DOC Learner drivers.

Table 26: Estimated Relative Risks of Learner Crash Involvement for New Drivers who Advanced to the Novice stage within their First Year of Licensure by DOC[+] Status – Adjusted for Age, Gender, and GLP Program (Early versus Full).

	All Crashes		Liable Crashes		Casualty Crashes		Material Damage Only Crashes	
DOC Status	**RR (95% CI[1])**	**% Difference (from REF)**	**RR (95% CI)**	**% Difference (from REF)**	**RR (95% CI)**	**% Difference (from REF)**	**RR (95% CI)**	**% Difference (from REF)**
DOC	1.57 (1.44-1.71)	**57%***	1.60 (1.43-1.79)	**60%***	1.41 (1.18-1.68)	**41%***	1.63 (1.47-1.80)	**63%***
No DOC	1.00 (REF)	-	1.00 (REF)		1.00 (REF)	-	1.00 (REF)	

**P<0.0001* *[+]DOC = Declaration of Completion certificate* *[1]CI=Confidence Interval*

The finding of a significant association between DOC status and Learner crash involvement rates is interesting but needs to be interpreted with caution. Due to the time incentive offered to promote participation, the drivers in the DOC group moved through the Learner stage much more quickly than those in the No DOC group. As indicated in the Year 3 evaluation, many of these drivers took the approved course specifically so that they could obtain their Novice licence sooner. Consequently, their motivation and, possibly, their driving exposures may have been different from those in the No DOC group, and these differences may have put them at greater risk of crash involvement. In an effort to minimize some of the exposure differences between the two groups, the analysis reported here was limited to drivers who obtained their Novice licence during their first year of licensure. Thus, the No DOC group would have been limited to drivers who were also motivated to move to the Novice stage fairly quickly. However, this was unlikely to remove all exposure related differences between the two groups.

The issue of exposure, in relation to driver education in the Learner stage is important, although to date it remains unclear. A recent study conducted in Ontario (Zhao, et al., 2006) reported similar findings for the association between learner crash rates and driver education. But after controlling for exposure the authors reported that the relationship reversed; drivers who took driver education had lower Learner crash rates than those who did not. However, no association was observed between DOC status and Learner driver exposure in the year 3 evaluation, nor in a more recent study conducted in BC and Oregon (Mayhew, et. al., 2006) in which teen drivers who took driving lessons or a traffic safety education course had significantly fewer hours of driving practice in the Learner stage than teens who did not. More research on the role of

exposure in the Learner stage and its relationship to driver education and Learner crash involvement rates is needed.

To explore associations with performance on the knowledge test, drivers in the DOC group were compared to drivers in the No DOC group according to whether or not they passed the test on the first or second attempt, or whether it took them 3 or more attempts. About 57% of the DOC group passed on the first attempt compared to 53% of the No DOC group; 26% of the DOC group passed on the second attempt compared to 27% of the No DOC group; and 17 % of the DOC group took three or more attempts compared to 20% of the No DOC groups. Although the percentages were similar for the two groups, they were found to be statistically significantly different (Chi Square = 83.7, df=2, P<0.0001). Although the sample sizes used in this assessment were large, making this a powerful test statistically, the magnitude of the differences in percentages may still reflect a small selection bias differentiating between DOC and No DOC drivers.

To determine whether the association between DOC status and performance on the knowledge test was strong enough to confound the previously observed relationship between test performance and Learner driver crash involvements, a second series of Poisson regression models was analyzed using DOC status (DOC, No DOC) as a control variable. As noted earlier, only the drivers from the Full GLP cohort could be included in this analysis because the number of attempts at both knowledge and road tests were not retained in the driver system after December 1, 2000. An examination of the Full GLP group revealed that 34% of the drivers in that group submitted a DOC compared to 31% of the drivers from the Full and Early GLP groups combined. Thus, the composition of the two groups, with respect to their DOC status, was similar.

With DOC status included in the models, the estimated relative risks of Learner crash involvement by the number of attempts at the road test were found to be the same as those obtained from the models in which DOC status was not included. For example, when DOC status was not included in the model (see page 58) the relative risk for Learner crash involvement for those who passed the knowledge test on the first attempt was estimated to be 0.79, indicating a 21% lower rate than those who took three or more tries. After adding DOC status to the model the relative risk was still 0.79 (95% Confidence interval: 0.69, 0.90). A similar result was obtained with drivers who passed on the second attempt. Both before and after adjusting for DOC status, this group's Learner crash rate remained 24% lower than that obtained for those who took three or more attempts (Relative Risk = 0.76 with 95% Confidence interval of 0.65, 0.89). Thus despite a significant association between DOC status and Learner crash involvement rates, DOC status was not found to be an important confounder in the association between performance on the knowledge test and the crash involvement rates of Learner drivers. The relationship appears to be consistent for both sets of drivers (DOC and No DOC) and, consequently, there doesn't appear to have been any self-selection into an approved course by drivers who had an easy or difficult time passing the test.

4.3 Summary

This study showed that GLP has successfully reduced the crash involvement rates of New drivers during their first four years of licensure. The reduction was greatest in the first year of licensure (when the impact of the GLP extended Learner stage was greatest) but remained present and statistically significant throughout the first four years. The estimated magnitude of the effect ranged from about 26% during the first year of licensure to about 12% during the first four years of licensure. These findings could not be explained by factors external to GLP. Time-matched Experienced driver groups were generally found to have higher crash involvement rates when compared over the same periods as the GLP and Pre-GLP drivers. Thus, the effects observed for GLP drivers are most likely attributable to the program.

In the preliminary Year 3 evaluation report (Wiggins, 2004), the New driver crash rate reduction attributed to GLP was reported to be about 16%. The crash rate comparison was based on the first group of drivers to participate in GLP and was based on a maximum of 3.4 years of follow-up and an average of 2.5 years of licensed-time per driver. To determine whether the results of the present evaluation would be consistent with those reported in the Year 3 evaluation, the data from the present study were reanalyzed using the same computational methods as were used previously. When computed in this way, and compared to the 1997 Pre-GLP rates, the overall age- and gender-adjusted crash rates for the 1999, 2000, and 2001 GLP driver cohorts were lower by about 13%, 16%, and 16% respectively. When compared to the rates of the 1996 Pre-GLP cohort, the GLP rates were lower by about 20%, 24%, and 23% respectively – producing an average reduction of about 17% across all groups. Clearly, the success of GLP has been enduring and stable.

As in the year 3 evaluation, the relative contributions of the Learner and Novice stages were investigated here. And, as reported in the preliminary evaluation, the primary factor contributing to the crash rate reduction associated with GLP was its longer Learner stage. Not unexpectedly, the extended Learner stage was found to have had the most significant impact on the overall New driver crash involvement rates during the first three years of licensure. By the end of the third year, most of the drivers in the GLP cohorts had progressed to the Novice stage, and the impact of the long learner stage had begun to diminish.

The GLP effect on the New driver crash rates was not, however, solely due to the impact of the extended Learner stage. Lower crash involvement rates were also obtained for GLP drivers while they were in the Learner stage. This suggests that the GLP Learner stage restrictions and conditions may also be having an impact. Issues relating to compliance were also apparent, however, and if successfully addressed suggest that even further crash rate reductions may be obtained.

A comparison of the crash involvement rates computed using crashes that occurred after drivers moved into the Novice stage revealed higher rates for the GLP than Pre-GLP Novice driver groups. However, due to the longer GLP Learner stage, the comparisons of GLP and Pre-GLP Novice rates calculated in this manner were confounded by the fact that the GLP drivers had spent less of each total period of licensure in the Novice stage. As noted earlier, previous research has shown that drivers are at their highest risk during the first few months of solo licensure. Consequently, by comparing the Novice driver rates using time-frames defined by the total period of licensure (from when they obtained their first Learner), the actual driver risks for Pre-GLP and GLP Novice drivers were quite different. Therefore, to more accurately estimate the impact of GLP on Novice drivers, a more detailed evaluation of the effects of the GLP Novice stage components and restrictions was conducted and is described in the next chapter (Study 2). The information on Novice drivers included here was provided for descriptive purposes only and is not intended to reflect the effectiveness, or lack thereof of, the GLP Novice stage.

Another interesting finding of this study was that the implementation of GLP appeared to have shifted the age of licensure downwards. Although there was only a minor shift in the gender distribution, a higher percentage of younger drivers obtained their Learner's licence in the GLP groups than in the Pre-GLP groups, and a higher percentage of older drivers obtained their Learner's in the Pre-GLP groups than in the GLP groups. In the early years of GLP some of this effect may have been due to age-eligible individuals entering the Pre-GLP system in an effort to avoid the restrictions of the new program. However, the shift was still apparent for drivers who obtained their licence in 2002. This suggests that the length of the licensing process may be prompting some drivers to get started sooner. The younger age of drivers in GLP was found to counteract the benefits of GLP by about 5 or 6%. Thus, for example, after adjusting for age (and gender) the estimated New driver crash involvement rate for GLP drivers in their first year of licensure was about 32%, 6 percentage points higher than the difference observed before adjustment.

Although interesting, the evaluation results based on the first four years of licensure for all New drivers do not provide an estimate of the program's effect for drivers who have completed all of its components. To fully evaluate the program's impact, drivers who have progressed through the Novice stage and into Full Privilege licensure are required. The assessment of this total program effect was conducted in stages. First, drivers who had obtained their Novice licence within each period of licensure (first year through first four years) were identified and assessed. Then, GLP drivers who had progressed to Full Privilege licensure were identified and assessed.

When limited to only those drivers who obtained a Novice licence during each period of licensure, the GLP effect was less pronounced than when all New drivers were used. For example, there was only about a 20% (Table 22) reduction in the age- and gender-adjusted one-year total crash involvement rate for GLP New drivers who got their Novice licence within their first year of licensure. This compares to the 32% (Table 21) reduction observed for all New drivers within the same period. The lowering of the program's road safety benefit during the first year of licensure is directly attributable to the reduced impact of the GLP Learner stage. Drivers who obtained their Novice licence in their first year of licensure simply spent less time in the Learner stage than drivers who obtained their Novice licence in their second, third, or fourth years of licensure. As the length of Learner time increased, the impact of obtaining a Novice licence decreased. Thus, when all New drivers with four years of licensure were included in the analyses, the reduction in the overall New driver crash rate was about 17% (Table 21); when the analysis was limited to those who got their Novice licence in that same period the reduction in crash rates was 14% (Table 22) - a difference of only 3 percentage points. During the first year of licensure the difference was 12 percentage points (20% - 32%). This dynamic nature of the licensing process makes it difficult to come up with a single measure of program effectiveness.

The time-dependency of the crash rate analysis was further highlighted when it was limited to GLP drivers who obtained their Full Privilege licence during the study period. Due to the time frame used for the evaluation only those drivers who progressed through the GLP licensing process the most quickly could be included. It soon became clear, however, that the percentage of the driver cohorts who had successfully progressed through the entire program was too small to provide an accurate estimate of the overall program impact. With only about 30% of the study cohorts graduating to full privilege licensure during the study period, the results obtained were relevant only to the most highly motivated drivers. These drivers may also be the ones who tend to drive more and, perhaps, under riskier conditions. Unfortunately, it was not possible to identify a similarly motivated group of drivers from the Pre-GLP cohort. Therefore, the comparisons between the GLP and Pre-GLP cohorts may have been confounded by these potential differences. This could result in the GLP drivers appearing to have higher New driver crash rates than will be observed when sufficient time has passed to include a higher percentage of program graduates. It was concluded, therefore, that it was too soon to estimate the overall program effect for GLP drivers who have experienced all of its components. Given current progression rates, an accurate estimate of the full program impact may not be obtainable until the majority of GLP drivers have completed at least six years of licensure.

In addition to assessing general GLP effects, this study also sought to explore effects associated with the program's stages of implementation (Full GLP and Early GLP). Unfortunately, the results from these analyses were mixed and difficult to interpret. Some positive effects were detected during the first two and three years of licensure when all New drivers were included in the analysis. However, no significant differences in crash rates were observed between the Full GLP and Early GLP groups when the analyses were restricted to Learner drivers. Although several documentation and system changes were made as part of the final release of GLP, only two components were added that might have been expected to have an impact New driver crash rates: the enhanced knowledge test that drivers had to pass to obtain their Learner licence, and the enhanced road test that Learner drivers had to pass to obtain their Novice licence. The lack

of an effect for Learner drivers suggests that at least one of the added components, the enhanced knowledge test, did not impact the New driver crash rates. However, it is possible that the positive effects observed for New drivers during the second and third years of licensure may have been due to the addition of the Novice road test. This possibility is explored in the next chapter of this report. It should be noted, that the lack of a knowledge test effect on the crash rates of Learner drivers does not mean that the test is not a valid, reliable, or useful tool. The knowledge test was designed to identify 'thinking drivers' and it may do that quite well. This objective of the knowledge test was not assessed. And, although passing the road test was not found to be associated with the crash involvement rates of Learner drivers, an association was found with the number of attempts it took to pass it; drivers who passed on the first or second attempt were estimated to have Learner crash rates that were about 21-24% lower than drivers who took three or more attempts to pass.

Finally, although a full assessment of the ICBC-approved driver education course was not included in this study, participation in an ICBC-approved driver education course was found to be associated with higher Learner crash rates. As discussed previously, however, this may have been due to unaccounted for differences in driving practice, exposure, or other motivational factors between the groups of drivers who submitted a DOC and those who did not. No evidence was obtained to indicate that the DOC group contained a higher percentage of drivers who had difficulty passing the knowledge test than were in the No DOC group.

5. Study 2 - GLP Impact on Novice Driver Crash Rates

The previous chapter described the results of a study undertaken to determine whether or not GLP had successfully reduced the crash involvement rates of New drivers during their first four years of licensure. The study described here is similar except that it was designed to evaluate the impact of GLP on the crash involvement rates of drivers once they had graduated from the supervised Learner stage and obtained their first solo licence.

One of the findings reported in the previous chapter was that most of the road safety benefit associated with GLP was due to the extension of the Learner stage. No crash rate reductions were observed for drivers once they entered the Novice stage. However, as was discussed in that section, the comparison of Novice driver rates may have been confounded by the differences in the minimum Learner driver times required for GLP and Pre-GLP drivers and the impact these differences had on the crash risks of the drivers during each period of licensure.

As in the previous study, the cohorts used in the present study were aggregated according to whether or not they had entered the licensing process during the Pre-GLP years, the Early GLP years, or the Full GLP years.

The purpose of the Novice Driver study was fourfold:

1. to assess the overall impact of GLP Novice driver restrictions and conditions on the crash involvement rates of Novice drivers,
2. to determine whether the full implementation of GLP (in particular the introduction of the enhanced Class 7 (or 8) road test) had an incremental impact on the effectiveness of GLP,
3. to investigate whether passing the Class 5 (or 6) exit road test had a detectable effect on GLP Novice or Full Privilege driver crash involvements, and
4. to determine whether the higher crash rates previously reported for novice drivers (Wiggins, 2004) who had completed an ICBC-approved driver education course and applied for early novice licensure was still apparent for new cohorts of novice drivers, and, in particular, for those who entered GLP after it was fully implemented

5.1 Methods

5.1.1 Design

As in the study of the impact of GLP on New driver crash involvement rates, this study used a before-after quasi-experimental, prospective research design with both historical and concurrent comparison groups.

5.1.2 Sample Selection Criteria

The focus of this chapter is on specific program effects (Early GLP, Full GLP and Pre-GLP). Therefore, only those Novice drivers who obtained both of their Learner and Novice licences in the same licensing program (Pre-GLP, Early GLP or Full GLP) were included. This was done to ensure consistency in the program components to which each Novice driver was exposed. It meant, however, that GLP drivers who obtained their Novice licence in 2001 or 2002 (Full GLP) but who obtained their Learner licence prior to 2001 (Early GLP) were excluded.

The following are the specific criteria that were used to create the GLP and Pre-GLP Novice driver samples:

GLP Novice Drivers Drivers from the GLP New driver cohorts who had obtained their first Novice licence in 1999 through 2002 and who had accumulated at least one and up to four years of solo licensure by the study cut-off date (June 30th, 2005). To ensure consistency in the licensing program to which GLP drivers were exposed, those who obtained their Novice licence during the Full GLP (2001, 2002) program years and their Learner licence during the Early GLP (1999, 2000) years were excluded.

Pre-GLP Novice Drivers Drivers from each of the Pre-GLP New driver cohorts who had obtained their first Full Privilege licence in 1996 or 1997 and who had accumulated at least one and up to four years of solo licensure by June 30th, 2002 (for the 1996 cohort) or June 30th 2003 (for the 1997 cohort).

5.1.3 Rate Calculations

For this study, the years of licensure used for the calculation of crash involvement rates were based on the total amount of licensed driver-time accumulated between the issue date of each driver's first solo licence (Full Privilege for Pre-GLP, Novice for GLP) and the end of each period of interest (first year, first two years first three years, first four years). During the second through fourth years of licensure, some GLP drivers advanced to a Full Privilege licence. In order to compare crash rates between the GLP and Pre-GLP drivers during these time periods, all crash involvements and licensed driver-time accumulated were counted, regardless of the driver's stage of licensure (Novice or Full Privilege) at the time of the crash. Thus, in this study, the word "Novice" is used to refer to a new "solo" driver; its use is not restricted to only those drivers who held a GLP "Novice" (Class 7 or 8) licence.

5.2 Results

5.2.1 Novice Driver Characteristics

Using the methods described in section 5.1.2, a total of 200,295 drivers were selected for inclusion in this study: 89,296 (44.6%) into the Pre-GLP Novice group, 55,856 (27.9%) into the Early GLP Novice group, and 55,143 (27.5%) into the Full GLP Novice group. The age and gender distributions of the three groups, as well as other driver characteristics, are described below.

Age and Gender at First Solo Licence. Tables 27 and 28 summarize the age and gender distributions for each of the Novice driver cohorts by the year in which they obtained their first solo licence, and by their licensing program (Pre-GLP, Early GLP or Full GLP). The pattern observed in the age distribution of these Novice drivers is similar to that found with the New driver cohorts (Table 2) except that there is a smaller percentage of 16 year old Novice drivers and a higher percentage of 17 year olds in the GLP cohorts than seen previously. The differences between the groups were found to be statistically significant ($P<0.0001$).

In contrast to the gender distributions observed for the New driver cohorts (Table 3), all of the Novice driver groups had a slightly higher percentage of males than females (Table 28). Though not a strong effect this suggests that males tend to move through their Learner stage somewhat more quickly than females. In addition, like the New driver cohorts, the total percentage of males increased after implementation of GLP. About half of the Pre-GLP Novice drivers were male compared to slightly more than half of the GLP drivers. Although the observed differences were small they were statistically significant ($P<0.0001$).

Table 27: Age Distribution at First Solo Licence by Licensing Year and Program

Age (in years)	Pre-GLP 1996-1997		Early GLP 1999-2000		Full GLP 2001-2002	
	N	%	N	%	N	%
16	37,291	41.8	26,163	46.8	24.148	43.8
17	13,413	15.02	16,159	28.9	16,667	30.2
18	6,101	6.8	4,007	7.2	4,710	8.5
19-21	7,619	8.5	3,556	6.4	4,359	7.9
22-24	3,717	4.2	1,287	2.3	1,242	2.3
>= 25	21,159	23.7	4,684	8.4	4,017	7.3
Total	89,296	100.0	55,856	100.0	55,143	100.0

Chi Square= 14,042.2; df = 10; P<0.0001

Table 28: Gender Distribution at First Solo Licence by Licensing Year and Program

Gender	Pre-GLP 1996-1997		Early GLP 1999-2000		Full GLP 2001-2002	
	N	%	N	%	N	%
Male	44,803	50.2	28,924	51.8	29,142	52.9
Female	44,488	49.8	26,927	48.2	25,999	47.2
N/A*	5	0.0	5	0.0	2	0.0
Total	89,296	100.0	55,856	100.0	55,143	100.0

** N/A = Not available.* *Chi Square =103.2; df=2; P<0.0001 (missing cases excluded)*

Length of time Spent in the Learner Stage by the Novice Driver Cohorts. Table 29 provides a summary of the amount of time spent in the Learner stage by the Pre-GLP and GLP Novice driver groups. As expected, given the extended Learner stage requirement for GLP drivers, drivers in the GLP Novice driver cohorts spent, on average, several more months in the Learner stage than their Pre-GLP counterparts. It should be noted, however, that the total amount of Learner-time that could be accumulated by these groups was limited to some extent by the method used to select Novice drivers into the study. Only drivers who obtained their first solo licence early enough to accumulate one, two, three and four years by the study cut-off date were considered for inclusion, and only those who obtained their first Learner licence in the same program as their first solo licence were selected. Based on these criteria, only 35,698 (65%) of the 55,143 drivers in the 2001-2002 cohort were able to accumulate three years, and only 2,684 (5%) were able to accumulate four years by the study cut-off date. The amount of Learner time shown in Table 29 does not, therefore, provide an estimate of the total Learner-time accumulated by GLP or Pre-GLP drivers. That estimate was provided in chapter 4 (Table 7). In that chapter it was shown that the average Learner times are between 8 and 9 months, for GLP drivers, and about 4.5 for Pre-GLP drivers. In this study, the Novice driver cohorts consist of drivers who progressed through the Learner stage more quickly and, consequently, they may not be

representative of all Novice drivers. This was particularly true for the subset of drivers in the four-year Full GLP group. The median Learner time for these drivers was only 3.5 months and the maximum was only 6.6 months. The drivers in this group clearly obtained their Novice licence as soon as they were eligible and many must have taken advantage of the opportunity for early licensure by completing an ICBC-approved driver education course. A further investigation of this group revealed that, in fact, 91% had submitted a DOC when they applied for Novice licensure. This compared to about 35% for the entire Full GLP group (which increased to 38% for the subset of this group with three years of solo licensure), and to about 31% of the Early GLP group. Due to the small number of drivers available in the four-year Full GLP group, and the over-representation of DOC drivers, this group was dropped from further consideration in this study.

Table 29: Licensed Driver-time Spent in the Learner Stage by Novice Driver Cohorts

Novice Driver Cohort	Months Spent in the Learner Stage :		
	Minimum	Maximum	Median
Pre-GLP 1996-1997 (N=89,296)	0.1	21.1	3.3
Early-GLP 1999-2000 (N=55,856)	2.9	23.9	6.5
Full-GLP 2001-2002			
Year1–Year2: (N=55,143)	2.9	24.0	6.5
Year 3: (N=35,698)*	2.9	18.3	6.3
Year 4: (N=2,684)*	2.9	6.6	3.5

**Includes only those drivers who completed the full period of licensure.*

Progression through the Novice stage for GLP Drivers. Table 30 shows the number and percentage of drivers in the Early and Full GLP cohorts who advanced to a GLP Full Privilege licence by the study cut-off date (June 30, 2005). As all GLP New drivers are required to spend at least 18 months in the Novice stage, no drivers graduated to a Full Privilege licence within the first year of obtaining their GLP Novice licence.

Table 30: Timing of Advancement to a Full Privilege Licence: GLP Novice Drivers Only

Obtained First Full Privilege Licence In:	Early GLP 1999 - 2000		Full GLP 2001- 2002	
	N	%	N	%
1st Year After First Novice Licence*	0	0.0	0	0.0
2nd Year After First Novice Licence	8,212	14.7	14,414	26.1
3rd Year After First Novice Licence	10,032	18.0	9,098#	16.5
4th Year After First Novice Licence	7,710	13.8	1,300#	2.4
Total by end of 4th Novice Year:	25,954	46.5	24,812#	45.0
No Full Privilege Licence Issued by the End of 4th Novice Year**	29,902	53.5	30,331#	55.0
Number of Drivers in Cohort	55,856	100.0	55,143	100.0

**The minimum time requirement in the Novice stage is 18 months so no drivers could obtain their solo licence in the first year.*

 # Counts are incomplete. Only a subset of the cohort was able to accumulate the full period of licensure by the end of the study.

Of interest in Table 30, is the higher percentage of drivers in the Full GLP who graduated out of GLP within their first 2 years of solo licensure (26.1% and 14.7%, respectively). Due to diminishing numbers of drivers in the Full GLP group, progression rates beyond the second year of licensure are limited. However, even with only about 65% of this group completing their third year, the percentage who had graduated out of GLP by the end of that year was almost as high as the percentage of Early GLP third-year graduates. This suggests that once all of the Full GLP drivers have completed their third year of solo licensure, the percentage of graduates may well exceed that seen in the Early GLP group.

While the reasons for the more rapid progression through the Novice stage of the Full GLP group are not known, it is possible that the implementation of GLPe in October 2003 had an impact. Prior to GLPe there were few reasons for GLP Novice drivers to apply to take their exit road test and obtain their Full Privilege licence. The restrictions in the Novice stage were minimal and, consequently, many drivers chose not progress. This changed, however, with the advent of GLPe, and the addition of a passenger restriction and prohibition-free requirement to the Novice stage. The possibility of being faced with such restrictions was not present for any of the Early GLP group while they were in their second or third years of licensure, and many had even completed their fourth year of licensure before GLPe was implemented. Thus, even though the changes in rules didn't apply to the drivers in the Full GLP cohort (unless they had to renew or apply to have their Novice licence reissued after the implementation date), the possibility of having to abide by the new rules may have been sufficient to prompt more drivers to make an effort to leave GLP as soon as possible. As time passes, and the data for both groups of drivers is updated, it is likely that the percentage of graduates in both groups will increase – during the third and fourth years of licensure for the Full GLP group, and as soon as their licence renewal means transition into GLPe for the Early for the Early group.

The counts presented in Table 30 were included to provide an estimate of the rate of progression from the issuance of the first Novice licence to when GLP drivers started to graduate out of the program. They do not necessarily reflect the number of drivers who were included in the calculation of rates or in the analysis of rates used to evaluate the program's impact on Novice drivers. The data contained in Table 30 were based on information obtained from all drivers whether or not they completed each period of licensure. For example, although a total of 24,812 drivers had obtained their Full privilege licence during the four year period after their Novice licence was issued, not all of those drivers had actually completed a full four years of licensure; they got their Full Privilege licence during their fourth year. For the evaluation of program impact, only those drivers who had accumulated a full one year, two years, three years or four years of licensure were included. As noted above, however, the small group of Full GLP drivers who were able to accumulate four years of licensure (N=2,684) were determined to be too different from the larger group to warrant inclusion and were dropped.

Table 31 shows the amount of licensed-driver-time accumulated by each of the study cohorts from the issue date of their first solo licence. As well, for GLP drivers, the amount and percentage of the total time that was accumulated on a Novice or Full Privilege licence is provided. Of the drivers who completed each period of licensure, only 26% of the Full GLP group and 15% of the Early GLP group had obtained their Full Privilege licence by the end of their second year of licensure; 38% of the Full GLP and 28% of the Early GLP group had obtained their Full Privilege licence by the end of their third year of solo licensure; and 46% of the Early group had obtained their Full privilege licence by the end of their fourth year of solo licensure. To ensure that crash rate calculations would be comparable between the GLP and Pre-GLP cohorts, the total licensed time accumulated from the issue date of the first solo licence was used, for all groups, in the calculation of the Novice driver crash involvement rates. The influence of obtaining a Full Privilege licence in GLP was explored by restricting the study groups to those who obtained their Full Privilege licence within each of the periods of licensure examined.

Table 31: Distribution of Licensed Driver-Time for GLP and Pre-GLP Novice Cohorts from the Issue Date of Their First Solo Licence by Years of Licensure

Novice Driver Cohort		Years of Licensure (from first solo Licence):			
		1st Year	1st Two Years	1st Three Years	1st Four Years
Pre-GLP 1996-1997	Total Licensed-Years (from first Novice licence)	89,078.84	174,609.0	254,193.4	333,974.4
Early-GLP 1999-2000 (N=55,856)	Novice Licensed-Years (% of Total)	55,090.0 (100)	105,835.0 (97.9)	144,421.7 (90.3)	173,369.4 (82.5)
	Full Privilege Licensed-Years (% of Total)	0.0 (0)	2,327.3 (2.1)	15,576.6 (9.7)	36,808.8 (17.5)
	Total	55,090.0	108,153.8	159,998.3	210,178.2
	Number (%) who got Full Privilege	0	8,212 (14.7)	18,229 (32.6)	25,684 (46.0)
Full-GLP 2001-2002 Year1–Year2: (N=55,143) Year 3: (N=35,698)*	Novice Licensed-Years (% of Total)	54,502.8 (100)	103,013.4 (95.8)	85,474.2 (84.2)	Not available
	Full Privilege Licensed-Years (% of Total)	0 (0)	4,571.7 (4.2)	16,082.1 (15.8)	
	Total	54,502.8	107,563.7	101,556.3	
	Number (%) who got Full Privilege	0	14,414 (26.1)	16,214 (29.4)	

**Only drivers who completed the full period of licensure have been included in this table.*

5.2.2 Characteristics of the Crash Involvements of Novice Drivers in their First Four Years of Solo Licensure

Approximately 27% of GLP Novice drivers and 24% of Pre-GLP Novice drivers were found to have been involved in at least one crash during their first year of solo licensure and up to 53-54% in both groups had been involved in at least one crash by the end of their fourth year of solo licensure. The average number of crashes per driver was found to be significantly ($P<0.0001$) higher for GLP than Pre-GLP drivers during their first three years of licensure but was about the same for drivers with four years of licensure (0.95 ± 0.004 per driver, respectively). At the end of the first year, the mean number of crash involvements reported by GLP Novices was 0.34 (SE = $\pm$ 0.002) and for Pre-GLP drivers it was 0.30 (SE = $\pm$ 0.002); at the end of the second year it was 0.59 (SE = $\pm$ 0.003) and 0.55 (SE = $\pm$ 0.003) respectively; and at the end of three years it was 0.77 (SE = $\pm$ 0.003) and 0.75 (SE = $\pm$ 0.003) respectively. Although these results are opposite to what would be predicted if GLP was effective in reducing the crash involvements of Novice drivers, a more appropriate analysis that takes into account amount of licensed driver-time and other potentially confounding factors is needed before any such conclusions can be drawn. For this crash involvement rates are needed. The impact of GLP on Novice crash involvement rates will be examined shortly. First some of the characteristics of the GLP and Pre-GLP Novice driver crash involvements are described.

Liability and Severity. Table 32 shows the breakdown of Novice driver crash involvements by whether or not the driver was deemed by a claims adjuster to have been held at least 50% liable for the crash. The results show that, across all three programs, about 65% of drivers were found to be liable for their crash involvements during their first year of solo licensure. This percentage went down as the length of licensure increased, resulting in only about 56% of the drivers being found liable for their crash involvements when considered over four years of licensure. The differences across programs were small, although the Pre-GLP

cohort was consistently found to have a slightly lower percentage of liable crash involvements than the GLP cohorts.

Table 32: Number (%) of Driver Crash Involvements by the Period of Solo Licensure and the Driver's Assigned Liability* for the Crash

Period of Licensure	Liability	Pre-GLP 1996 - 1997	Early GLP 1999 - 2000	Full GLP 2001 - 2002
1st Year	Liable	16,757 (64.5)	11,727 (65.6)	11,844 (66.7)
	Non-Liable	9,207 (35.5)	6,061 (34.0)	5,641 (31.8)
	Liability not Assigned	11 (0.0)	67(0.4)	275 (1.5)
	Total	25,975 (100.0)	17,855 (100.0)	17,760 (100.0)
1st Two Years	Liable	28,989 (60.3)	20,048 (61.6)	19,747 (63.1)
	Non-Liable	19,087 (39.6)	12,288 (37.8)	10,922 (34.9)
	Liability not Assigned	38 (0.1)	194 (0.6)	646 (2.0)
	Total	48,114 (100.0)	32,530 (100.0)	31,315 (100.0)
1st Three Years	Liable	39,370 (57.3)	26,655 (59.2)	17,069 (60.5)
	Non-Liable	29,064 (42.6)	17,973 (39.9)	10,445 (37.0)
	Liability not Assigned	73 (0.1)	377 (0.9)	690 (2.5)
	Total	68,507 (100.0)	45,005 (100.0)	28,204 (100.0)+
1st Four Years	Liable	48,667 (55.5)	31,949 (57.4)	-
	Non-Liable	38,915 (44.4)	23,025 (41.4)	-
	Liability not Assigned	127 (0.1)	683 (1.2)	-
	Total	87,709 (100.0)	55,657 (100.0)	-

**Liability is assigned to a driver who is found (by a claims adjuster) to be at least 50% responsible for the crash*

+Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.

Table 33 shows the breakdown of Novice crash involvements by the severity of the crash. Although there were more fatal crashes observed in the Novice driver groups than in the New driver groups, the numbers were still quite small. Consequently, in subsequent rate calculations and comparative analyses, only the aggregated category of casualty (fatal plus injury) crashes will be used. As shown in Table 33, the relative frequency of injury and material damage only crashes remained very consistent, regardless of the period of licensure examined. About 28-30% of all Novice driver crash involvements were found to involve an injury.

Alcohol, Time of day and Passenger involvement in Novice driver crashes.. The rules and conditions in GLP for Novice drivers are less restrictive than for GLP Learner drivers. Before the implementation of GLPe in 2003, the primary restriction on Novices was that they had to maintain a Zero Blood Alcohol level at all times while driving. The relative frequency of crash involvements in which GLP Novice drivers were reported by police to have alcohol as a contributing factor is presented in Table 34. As can be seen, although alcohol involvement was a relatively infrequent contributing factor in the crash involvements of Novice drivers, the percentages increased steadily as the length of the period of solo licensure increased. Thus, in the first year of solo licensure only about 3-4% of drivers were reported to have alcohol as a contributing factor, but over the first four years this percentage increased to 5-6%. The magnitude of the differences in percentages across the program groups was small and suggests that alcohol involvement as a contributing factor in Novice driver crashes has remained relatively stable.

Table 33: Number (%) of Driver Crash Involvements by the Period of Solo Licensure and Severity of the Crash

Period of Licensure	Severity	Pre-GLP 1996 - 1997	Early GLP 1999 - 2000	Full GLP 2001 - 2002
1st Year	Fatal	35 (0.1)	24 (0.1)	20 (0.1)
	Injury	8,038 (31.0)	5,078 (28.4)	5,035 (28.4)
	Material Damage Only	17,902 (68.9)	12,753 (71.5)	12,705 (71.5)
	Total	25,975 (100)	17,855 (100)	17,760 (100)
1st Two Years	Fatal	64 (0.1)	50 (0.2)	41 (0.1)
	Injury	14,742 (30.6)	9,249 (28.4)	8,930 (28.5)
	Material Damage Only	33,308 (69.2)	23,231 (71.4)	22,344 (71.4)
	Total	48,114 (100)	32,530 (100)	31,315 (100)
1st Three Years	Fatal	87 (0.1)	69 (0.1)	38 (0.1)
	Injury	20,794 (30.4)	12,850 (28.6)	7,963 (28.2)
	Material Damage Only	47,626 (69.5)	32,086 (71.3)	20,203 (71.6)
	Total	68,507 (100)	45,005 (100)	28,204 (100)[+]
1st Four Years	Fatal	108 (0.1)	82 (0.1)	-
	Injury	26,291(30.0)	15,840 (28.5)	-
	Material Damage Only	61,310 (69.9)	39,726 (71.4)	-
	Total	87,709 (100)	55,657 (100)	-

[+] *Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.*

Table 34: Number (%) of Driver Police-Reported Crash Involvements* by the Period of Solo Licensure and Whether or not Police identified Alcohol as a Novice Driver Contributing Factor

Period of Licensure	Alcohol Involvement	Pre-GLP 1996 - 1997	Early GLP 1999 - 2000	Full GLP 2001 - 2002
1st Year	Yes	232 (3.6)	133 (3.0)	160 (3.2)
	No	6,298 (96.5)	4,318 (97.0)	4,790 (96.8)
	Total	6,530 (100.0)	4,451 (100.0)	4,950 (100.0)
1st Two Years	Yes	459 (4.3)	304 (3.9)	334 (4.0)
	No	10,303 (95.7)	7,481 (96.1)	8,008 (96.0)
	Total	10,762 (100.0)	7,785 (100.0)	8,342 (100.0)
1st Three Years	Yes	705 (4.9)	515 (5.0)	316 (4.5)
	No	13,695 (95.1)	9,898 (95.1)	6,684 (95.5)
	Total	14,400 (100.0)	10,413 (100.0)	7,000 (100.0)[+]
1st Four Years	Yes	1,004 (5.7)	686 (5.4)	30 (4.4)
	No	16,552 (94.3)	11,967 (94.6)	649 (95.6)
	Total	17,556 (100.0)	12,653 (100.0)	679 (100.0)[+]

**Crash counts reported here differ from those in Tables 32 and 33 because they were taken from the Traffic Accident System rather than from ICBC Claims.*

[+] *Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.*

Tables 35 and 36 provide the relative frequency of Novice crash involvements by the time of day and age and number of passengers in the vehicle when the crash occurred. These are provided for descriptive purposes only. None of the Novice drivers included in this study were restricted in the number of passengers permitted or in the time of day when they could legally drive.

With respect to the time of day when crashes occurred, most of the Novice driver crash involvements occurred between 5:00 am and midnight, with about an equal split of crashes before and after 5:00 pm. A slightly smaller percentage of crashes occurred late at night (after midnight) during the first year of solo licensure than when the first four years of solo licensure were considered.

Table 35: Number (%) of Police-Reported Driver Crash Involvements* by the Period of Solo Licensure and Time of Day when the Crash Occurred

Period of Licensure	Time of Crash	Pre-GLP	Early GLP	Full GLP
		1996-1997	1999-2000	2001-2002
1st Year	Midnight – 5:00 am	516 (7.9)	415 (9.3)	417 (8.4)
	5:00 am – 5:00 pm	3,222 (49.3)	2,111 (47.4)	2,402 (48.5)
	5:00 pm – Midnight	2, 681 (41.1)	1, 837 (41.3)	2, 017 (40.8)
	Unknown	111 (1.7)	88 (2.0)	114 (2.3)
	Total	6,530 (100.0)	4,451 (100.0)	4,950 (100.0)
1st Two Years	Midnight – 5:00 am	982 (9.1)	816 (10.5)	795 (9.5)
	5:00 am – 5:00 pm	5,338 (49.6)	3,775 (48.5)	4,098 (49.1)
	5:00 pm – Midnight	4,256 (39.6)	3,044 (39.1)	3,265 (39.1)
	Unknown	186 (1.7)	150 (1.9)	184 (9.5)
	Total	10,762 (100.0)	7,785 (100.0)	8,342 (100.0)
1st Three Years	Midnight – 5:00 am	1467 (10.2)	1,170 (11.2)	702 (10.3)
	5:00 am – 5:00 pm	7,097 (49.3)	5,123 (49.2)	3,426 (48.9)
	5:00 pm – Midnight	5, 591 (38.8)	3,914 (37.6)	2,717 (38.8)
	Unknown	245 (1.7)	206 (2.0)	155 (2.2)
	Total	14,400 (100.0)	10,413 (100.0)	7,000 (100.0)+
1st Four Years	Midnight – 5:00 am	1,935 (11.0)	1,472 (11.6)	-
	5:00 am – 5:00 pm	8,656 (49.3)	6,209 (49.1)	-
	5:00 pm – Midnight	6,665 (38.0)	4,714 (37.3)	-
	Unknown	300 (1.7)	258 (2.0)	-
	Total	17,556 (100.0)	12,653 (100.0)	-

**Crash counts reported here differ from those in Tables 32 and 33 because they were taken from the Traffic Accident System rather than from ICBC Claims.*

+*Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.*

As shown in Table 36, about 50-60% of all Novice driver crash involvements in each study period occurred when the driver was alone, without any passengers. About one in three of the first-year crash involvements occurred when there was at least one passenger under the age of 19 in the vehicle and no adults present. Over the first four years of licensure the percentage dropped to between 20 and 25%. These findings were fairly consistent across Program groups.

Table 36: Number (%) of Police-Reported Driver Crash Involvements* by the Period of Solo Licensure and the Number and Ages of Passengers in the Vehicle

Period of Licensure	Passengers in Vehicle	Pre-GLP 1996-1997	Early GLP 1999-2000	Full GLP 2001-2002
1st Year	No more than 2 – at least 1 of whom was 19 or older	833 (12.8)	383 (8.6)	407 (8.2)
	None	3,214 (49.2)	2,211 (49.7)	2,759 (55.7)
	1 or more – all under 19	2,037 (31.2)	1,615 (36.3)	1,561 (29.9)
	Unknown	446 (6.8)	242 (5.4)	223 (4.5)
	Total	6,530 (100.0)	4,451 (100.0)	4,950 (100.0)
1st Two Years	No more than 2 – at least 1 of whom was 19 or older	1,448 (13,5)	822 (10.6)	821 (9.8)
	None	5,600 (52.0)	4,168 (53.4)	4,882 (58.5)
	1 or more – all under 19	3,027 (28.1)	2,411 (31.0)	2,319 (27.8)
	Unknown	687 (6.4)	384 (4.9)	320 (3.8)
	Total	10,762 (100.0)	7,785 (100.0)	8,342 (100.0)
1st Three Years	No more than 2 – at least 1 of whom was 19 or older	2,165 (15.0)	1,303 (12.5)	794 (11.3)
	None	7,826 (54.4)	5,898 (56.6)	4,202 (60.0)
	1 or more – all under 19	3,540 (24.6)	2,727 (26.2)	1,736 (24.8)
	Unknown	869 (6.0)	485 (4.7)	268 (3.8)
	Total	14,400 (100.0)	10,413 (100.0)	7,000 (100.0)+
1st Four Years	No more than 2 – at least 1 of whom was 19 or older	2,907 (16.6)	1,787 (14.1)	-
	None	9,847 (56.1)	7,435 (58.8)	-
	1 or more – all under 19	3,800 (21.7)	2,864 (22.6)	-
	Unknown	1,002 (5.7)	567 (4.5)	-
	Total	17,556 (100.0)	12,653 (100.0)	-

**Crash counts reported here differ from those in Tables 32 and 33 because they were taken from the Traffic Accident System rather than from ICBC Claims.*

+*Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.*

5.2.3 Novice Driver Crash Involvement Rates

Novice crash involvement rates were computed for each study cohort and each period of solo licensure. They are summarized in Table 37. A comparison of the Novice driver rates shown in Table 37 with those for the Learner drivers shown in Table 24 reveals the magnitude of the impact of transitioning from driving with supervision to driving without supervision. The rates for Novice drivers shown in Table 37 are almost 10 times as high as the Learner rates.

Table 37: Novice Crash Involvement Rates (per 100 licensed-years) and 95% Confidence Intervals by Program and Period of Solo Licensure

Crash Type by Period of Licensure	Pre-GLP	Early GLP	Full GLP+
	1996-1997	1999-2000	2001-2002
All Crashes:			
1st Year	29.16 (28.81-29.51)	32.41 (31.93-32.89)	32.59 (32.11-33.07)
1st Two Years	27.56 (27.31-27.81)	30.08 (29.75-30.41)	29.11 (28.79-29.43)
1st Three Years	26.95 (25.75-27.15)	28.13 (27.87-28.39)	27.77 (27.45-28.09)+
1st Four Years	26.26 (26.09-26.43)	26.48 (26.26-26.70)	-
Liable Crashes:			
1st Year	18.81 (18.53-19.09)	21.29 (20.90-21.68)	21.73 (21.34-22.12)
1st Two Years	16.60 (16.41-16.79)	18.54 (18.26-18.80)	18.36 (18.10-18.62)
1st Three Years	15.49 (15.34-15.64)	16.66 (16.46-16.86)	16.80 (16.55-17.05)+
1st Four Years	14.57 (14.44-14.70)	15.20 (15.03-15.37)	-
Casualty Only:			
1st Year	9.06 (8.86-9.26)	9.26 (9.01-9.51)	9.28 (9.02-9.54)
1st Two Years	8.48 (8.34-8.62)	8.60 (8.43-8.77)	8.34 (8.17-8.51)
1st Three Years	8.21 (8.10-8.32)	8.07 (7.93-8.21)	7.88 (7.71-8.05)+
1st Four Years	7.90 (7.80-8.00)	7.58 (7.46-7.70)	-
Material Damage:			
1st Year	20.10 (19.81-20.39)	23.15 (22.75-23.55)	23.31 (22.90-23.72)
1st Two Years	19.08 (18.88-19.28)	21.48 (21.20-21.76)	20.77 (20.50-21.04)
1st Three Years	18.74 (18.57-18.91)	20.05 (19.83-20.27)	19.89 (19.62-20.16)+
1st Four Years	18.36 (18.21-18.51)	18.90 (18.71-19.09)	-

+*Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.*

Interestingly, the GLP Novice rates shown in Table 37 are lower than the GLP Novice rates shown in Table 24, while the Pre-GLP rates have changed little. This supports the notion raised previously that one of the reasons the GLP Novice rates were found to be significantly higher than the Pre-GLP rates, when analyzed within the context of the New driver timelines, was the difference in the crash risks of the different Novice driver groups. By standardizing the amount of Novice driver-time across the groups, a more accurate estimate of the GLP effect on Novice crash rates can be obtained. Nonetheless, despite the fact that the GLP rate is now lower, it still remains higher than that of the Pre-GLP comparison group.

To investigate whether full participation in GLP, including taking and passing the Class 5 or 6 exit road test, might have had an impact on Novice crash rates, crash rates were also calculated for the subgroup of GLP Novice drivers who obtained their Full privilege licence during each period of solo licensure (Table 38). Once again, these rates were based on the total number of crashes that occurred during the time period whether they occurred before or after the driver's Full privilege licence had been obtained.

Table 38: Novice Crash Involvement Rates (per 100 licensed-years) and 95% Confidence Intervals for Drivers who Graduated Out of GLP within each Period of Solo Licensure

Crash Type by Period of Licensure	Early GLP	Full GLP[+]
	1999 - 2000	2001-2002
All Crashes:		
1st Two Years	30.75 (29.90-31.60)	29.84 (29.21-30.47)
1st Three Years	29.93 (29.65-30.21)	28.63 (28.30-28.96)[+]
1st Four Years[+]	28.41 (28.17-28.65)	-
Liable Crashes:		
1st Two Years	17.54 (16.90-18.18)	17.50 (17.02-17.98)
1st Three Years	16.75 (16.55-16.95)	16.66 (16.41-16.91)[+]
1st Four Years	15.60 (15.43-15.77)	-
Casualty Crashes:		
1st Two Years	7.69 (7.26-8.12)	8.11 (7.78-8.44)
1st Three Years	7.90 (7.76-8.04)	7.75 (7.58-7.92)[+]
1st Four Years[+]	7.67 (7.55-7.79)	-
Material Damage Only Crashes:		
1st Two Years	23.06 (22.32-23.80)	21.73 (21.19-22.27)
1st Three Years	22.03 (21.79-22.27)	20.87 (20.58-21.16)[+]
1st Four Years[+]	20.73 (20.53-20.93)	-

[+]*Based on the subset (N=35,698) of cohort (N=55,143) with three full years of solo licensure.*

Due to the 18 month minimum time requirement for the GLP Novice stage, no drivers had graduated by the end of their first year of solo licensure. Consequently, the rates shown in Table 38 could only be calculated for drivers for whom two, three, and four years had passed since they obtained their first Novice licence. With the exception of two-year liable and casualty crashes, the rates shown in Table 38 tended to be slightly higher than those reported in Table 37. The significance of these differences will be examined in the following section.

5.2.4 GLP Impact on Short- and Longer-term Novice Crash Involvement Rates

Table 39 summarizes the results of the Poisson regression analyses conducted to compare the crude (unadjusted) crash involvement rates of the Early and Full GLP Novice driver groups to those of the Pre-GLP group. The results revealed that, in contrast to the results presented in chapter 4 for New and Learner drivers, GLP did not have a clear and consistently positive impact on the crash rates of Novice drivers. With the exception of casualty crashes, the relative risks computed for the other crash categories were all significantly greater than one indicating higher rates for the GLP groups than for the Pre-GLP group. The results for casualty crashes were more encouraging in that they indicated some reductions in rates for GLP compared to Pre-GLP drivers, but the magnitudes of the reductions were small and tended to be only moderately or marginally significant. In addition, although a few of the relative risks indicated that the crash rates for the Full GLP group were slightly lower than for the Early group, few of these differences were statistically significant. The GLP implementation effect will be further explored later.

Table 39: Relative Risks of Crash Involvement for Drivers in their First Four Years of Solo Licensure

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Solo Licensure When Crashes Occurred	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year of Licensure								
Full GLP (2001-2002)	1.12 (1.10, 1.14)	**+12%***	1.16 (1.13, 1.18)	**+16%***	1.02 (0.99, 1.06)	**+2%**	1.16 (1.13, 1.19)	**+16%***
Early GLP (1999-2000)	1.11 (1.09, 1.13)	**+11%***	1.13 (1.11, 1.16)	**+13%***	1.02 (0.99, 1.06)	**+2%**	1.15 (1.13, 1.18)	**+15%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.00 (0.98, 1.03)	**+0%**	1.02 (1.00, 1.05)	**+2%**	1.00 (0.96, 1.04)	**0%**	1.01 (0.98, 1.03)	**+1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	1.06 (1.04, 1.07)	**+6%***	1.11 (1.09, 1.13)	**+11%***	0.98 (0.96, 1.01)	**-2%**	1.09 (1.07, 1.11)	**+9%***
Early GLP (1999 – 2000)	1.09 (1.08, 1.11)	**+9%***	1.12 (1.10, 1.14)	**+12%***	1.01 (0.99, 1.04)	**+1%**	1.13 (1.11, 1.15)	**+13%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.97 (0.95, 0.98)	**-3%***	0.99 (0.97, 1.01)	**-1%**	0.97 (0.94, 1.00)	**-3%****	0.97 (0.95, 0.99)	**-3%****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	1.03 (1.02, 1.04)	**+3%***	1.09 (1.07, 1.10)	**+9%***	0.96 (0.93, 0.98)	**-4%****	1.06 (1.04, 1.08)	**+6%***
Early GLP (1999-2000)	1.04 (1.03, 1.06)	**+4%***	1.08 (1.06, 1.09)	**+8%***	0.98 (0.96, 1.00)	**-2%*****	1.07 (1.06, 1.09)	**+7%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.99 (0.97, 1.00)	**-1%**	1.01 (0.99, 1.03)	**+1%**	0.98 (0.95, 1.00)	**-2%**	0.99 (0.97, 1.01)	**-1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years of Licensure								
Early GLP (1999 – 2000)	1.01 (1.00, 1.02)	**+1%**	1.04 (1.03, 1.6)	**+4%***	0.96 (0.94, 0.98)	**-4%***	1.03 (1.02, 1.04)	**+3%****
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-

*P < 0.0001 **P < 0.005 ***P<0.05 [1] *CI = Confidence Interval*

Comparison of Novice and Experienced Driver Crash Involvement Rates. To determine whether the changes observed in the Novice driver rates might be a reflection of external factors other than GLP, the crash involvement rates of the Novice driver groups were compared to those of time-matched Experienced driver groups. Comparisons were done using each of the four periods of licensure for the rate calculations (one year through four years). Due to the limited number of drivers with four years of solo licensure in the Full GLP study group, Table 40 shows the results obtained from the analysis of the three-year rates. For both the Novice driver and Experienced driver groups, the crash rates observed for the 1999-2000 and 2001-2002 time periods tended to be higher than those observed for 1996-1997. The only exception was for casualty crashes. Both groups had lower casualty crash rates in the GLP years than in the Pre-GLP years. Whether higher or lower, however, the pattern of change observed for the Novice and Experienced driver groups was the same. Consequently, there was little evidence to suggest that any of the increases or decreases observed for the Novice groups were attributable to GLP. In contrast, based on these global comparisons it would appear that GLP had very little impact. Similar results were obtained for all of the time periods examined.

Table 40: Three-Year Crash Involvement Rates (per 100 drivers)[1], Relative Risks (RR) and 95% Confidence Intervals (CI) for Novice and Experienced Drivers

Crash Type by Program Period	Novice Drivers			Experienced Drivers		
	Crash Rate (95% CI)	RR (95% CI)	% Change (from REF)	Crash Rate (95% CI)	RR (95% CI)	% Change (from REF)
All Crashes						
Full GLP (2001-2002)	26.34 (26.03-26.65)	1.03 (1.02,1.04)	**+3%***	12.82 (12.78-12.86)	1.04 (1.04,1.05)	**+4%***
Early GLP (1999 – 2000)	26.86 (26.61-27.11)	1.05 (1.04,1.06)	**+5%***	12.80 (12.77-12.83)	1.04 (1.04,1.04)	**+4%***
Pre-GLP (1996 – 1997)	25.57 (25.38-25.76)	1.00 (REF)	-	12.29 (12.26-12.32)	1.00 (REF)	-
Liable Only						
Full GLP (2001-2002)	15.94 (15.70-16.18)	1.08 (1.07,1.10)	**+8%***	5.52 (5.49-5.54)	1.07 (1.06,1.07)	**+7%***
Early GLP (1999 – 2000)	15.91 (15.72-16.10)	1.08 (1.07,1.10)	**+8%***	5.40 (5.38-5.42)	1.05 (1.04,1.05)	**+5%***
Pre-GLP (1996 – 1997)	14.70 (14.55-14.85)	1.00 (REF)	-	5.16 (5.14-5.18)	1.00 (REF)	-
Casualty Only						
Full GLP (2001-2002)	7.47 (7.31-7.63)	0.96 (0.93,0.98)	**-4%*****	3.13 (3.11-3.15)	0.96 (0.95,0.97)	**-4%***
Early GLP (1999 – 2000)	7.71 (7.58-7.84)	0.99 (0.97,1.01)	**-1%**	3.18 (3.17-3.19)	0.98 (0.97,0.98)	**-2%***
Pre-GLP (1996 – 1997)	7.80 (7.69-7.91)	1.00 (REF)	-	3.26 (3.25-3.27)	1.00 (REF)	-
Material Damage Only						
Full GLP (2001-2002)	18.86 (18.60-19.12)	1.06 (1.04,1.08)	**+6%***	9.69 (9.66-9.72)	1.07 (1.07,1.08)	**+7%***
Early GLP (1999 – 2000)	19.15 (18.94-19.36)	1.08 (1.06,1.09)	**+8%***	9.61 (9.59-9.63)	1.06 (1.06,1.07)	**+6%***
Pre-GLP (1996 – 1997)	17.78 (17.62-17.94)	1.00 (REF)	-	9.04 (9.02-9.06)	1.00 (REF)	-

*P < 0.0001 **P<.001 ***P<.05

[1]*Rates were calculated per 100 drivers as licensed driver-time was not available for the experienced driver groups.*

Before drawing conclusions about the impact of GLP on Novice crash rates, however, it is important to look at other factors that may be influencing the results. In keeping with the results presented in chapter 4, the implementation of GLP tended to shift the age distribution of New drivers downward. Although some of this effect was counteracted by the GLP extended Learner stage, GLP drivers still tended to be younger than the Pre-GLP comparison group when they obtained their first solo licence. The GLP Novice groups also had a slightly higher percentage of male drivers. Both of these factors are known to be associated with higher crash risks and, consequently, could be elevating the relative risks obtained for the New driver groups. Although the age and gender shift is a potentially unintended negative consequence of implementing GLP, it is important to exclude the influence of these factors in order to ascertain whether any of the actual program components also

had an effect. The following section describes the analyses done to re-estimate the relative risks for the GLP Novice groups after taking age and gender differences into account. As well, the results obtained when the GLP Novice groups were restricted to those who got their Full Privilege during each period of licensure are presented.

Age and Gender Effects on Novice Driver Crash Involvement Rates. As summarized in Tables 41 and 42, after adjusting for age and gender, the differences in crash rates between the GLP and Pre-GLP driver groups were much smaller. The effect was most apparent for the subset of drivers who advanced to a Full Privilege licence (Table 42), and particularly for those who graduated out of GLP before the end of their second year of solo licensure. For these drivers, many of the adjusted relative risks fell below one, indicating lower estimated rates for the GLP than the Pre-GLP Novice drivers. The effect was also more pronounced for liable and casualty crashes. It appears, therefore, that the shift in the age and gender distributions observed in the GLP cohorts, relative to the Pre-GLP group, may have increased the GLP Novice crash rate and masked, to some extent, the effectiveness of the GLP program components. Nonetheless, to the extent that the implementation of GLP prompted younger male drivers to apply for licensure sooner, this effect would have to be considered a consequence of GLP, albeit one having a negative impact on the crash rates of Novice drivers. As noted in chapter 4, the trend in the age and gender distributions of GLP drivers will continue to be monitored to see if it is maintained over time, and to see what impact the implementation of GLPe, with its even longer Learner and Novice stage requirements, might have.

With respect to the effect of full GLP implementation on Novice crash rates after adjustment for age and gender, the results were inconsistent. During the first year of licensure there was no apparent effect; the relative risks for the comparison of Full GLP to Early GLP drivers remained close to one for all of the categories of crashes. For the first two and three years of licensure, however, all of the relative risks fell below one, and many were found to be at least marginally statistically significant. While this suggests the possibility of an implementation effect, the failure to find a difference for drivers in the first year of licensure makes the findings difficult to interpret. Given that full implementation consisted primarily of the addition of the enhanced knowledge and level 1 road test, it was expected that, if these components had an impact, it would have been most likely to be seen in the year following completion of the road test. Further investigation of the impact of the level 1 road test was undertaken and will be discussed in a later section.

Whether adjusted for age and gender differences or not, one other trend observed in the analysis of Novice crash involvement rates is worthy of note. With the exception of casualty crashes (which were an exception with experienced drivers as well), the magnitude of the estimated relative risks for Novice crashes were significantly greater than one for both the first and first two years of licensure. Although the unadjusted ratios remained higher than one for Novice drivers with three years of licensure, the magnitudes were smaller, and became less than one after taking into account age and gender. This positive effect is shown graphically in Figure 2 with the presentation of the monthly crash rates of the Early GLP cohort over their first four years of licensure. As can be seen, the crash rates of the GLP drivers were considerably higher than those of the Pre-GLP drivers throughout their first two years of solo licensure. During the third year they levelled off to a level similar to that of the Pre-GLP group, but by the fourth year the GLP rates started to drop considerably lower. Whether this is indicative of a GLP component effect (e.g., the longer Learner stage, the new exit road test, or simply the Novice stage restrictions), or the result of other factors, is unclear. The possibility of external factors can not be completely excluded. However, a comparison to the monthly crash rates of the time-matched Experienced drivers failed to reveal a distinctive trend suggesting such an influence. Although the crash rates of both the Pre-GLP and GLP time-matched groups declined slightly over their four year follow-up periods, the rate of decline was not greater for the GLP-matched group. Therefore, unless some external factor affected the GLP New drivers in some way differently from the Experienced drivers (for example, if New drivers curtailed their driving more as the cost of fuel increased), some other explanation for the observed GLP trend needs to sought. More follow-up time will be required to ascertain whether the trend will continue when the complete cohort of Full GLP drivers have passed through their third and fourth years of licensure. In the next section, the results of analyses undertaken to explore the impact the extended Learner stage on Novice driver crash rates are described.

Table 41: Estimated Relative Risks of Crash Involvement for Drivers in their First Four Years of Solo Licensure – Adjusted for Age at Solo Licensure and Gender

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Solo Licensure When Crashes Occurred	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year								
Full GLP (2001-2002)	1.05 (1.03, 1.08)	**+5%***	1.06 (1.04, 1.09)	**+6%***	0.95 (0.92, 0.99)	**-5%*****	1.10 (1.08, 1.13)	**+10%***
Early GLP (1999-2000)	1.06 (1.04, 1.08)	**+6%***	1.05 (1.03, 1.08)	**+5%***	0.96 (0.93, 1.00)	**-4%*****	1.10 (1.08, 1.13)	**+10%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	1.00 (0.98, 1.02)	**+0%**	1.01 (0.99, 1.04)	**+1%**	0.99 (0.95, 1.03)	**-1%**	1.00 (0.98, 1.03)	**+0%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years								
Full GLP (2001 – 2002)	1.00 (0.99, 1.02)	**+0%**	1.02 (1.00, 1.04)	**+2%*****	0.92 (0.90, 0.95)	**-8%***	1.04 (1.02, 1.05)	**+4%***
Early GLP (1999 – 2000)	1.04 (1.03, 1.06)	**+4%***	1.04 (1.02, 1.06)	**+4%***	0.96 (0.93, 0.99)	**-4%****	1.08 (1.06, 1.10)	**+8%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.96 (0.95, 0.98)	**-4%***	0.98 (0.96, 1.00)	**-2%**	0.96 (0.93, 0.99)	**-4%*****	0.96 (0.94, 0.98)	**-4%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years								
Full GLP (2001-2002)	0.97 (0.95, 0.98)	**-3%***	1.00 (0.98, 1.01)	**+0%**	0.89 (0.86, 0.91)	**-11%***	0.99 (0.98, 1.01)	**-1%**
Early GLP (1999-2000)	0.99 (0.98, 1.00)	**-1%**	1.00 (0.99, 1.02)	**+0%**	0.92 (0.90, 0.95)	**-8%***	1.02 (1.01, 1.03)	**+2%*****
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.98 (0.96, 0.99)	**-2%****	0.99 (0.97, 1.01)	**-1%**	0.96 (0.93, 0.99)	**-4%*****	0.97 (0.96, 0.99)	**-3%*****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years								
Early GLP (1999-2000)	0.96 (0.95,0.976)	**-4%***	0.97 (0.96,0.99)	**-3%***	0.90 (0.88,0.92)	**-10%***	0.98 (097,1.00)	**-2%*****
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-

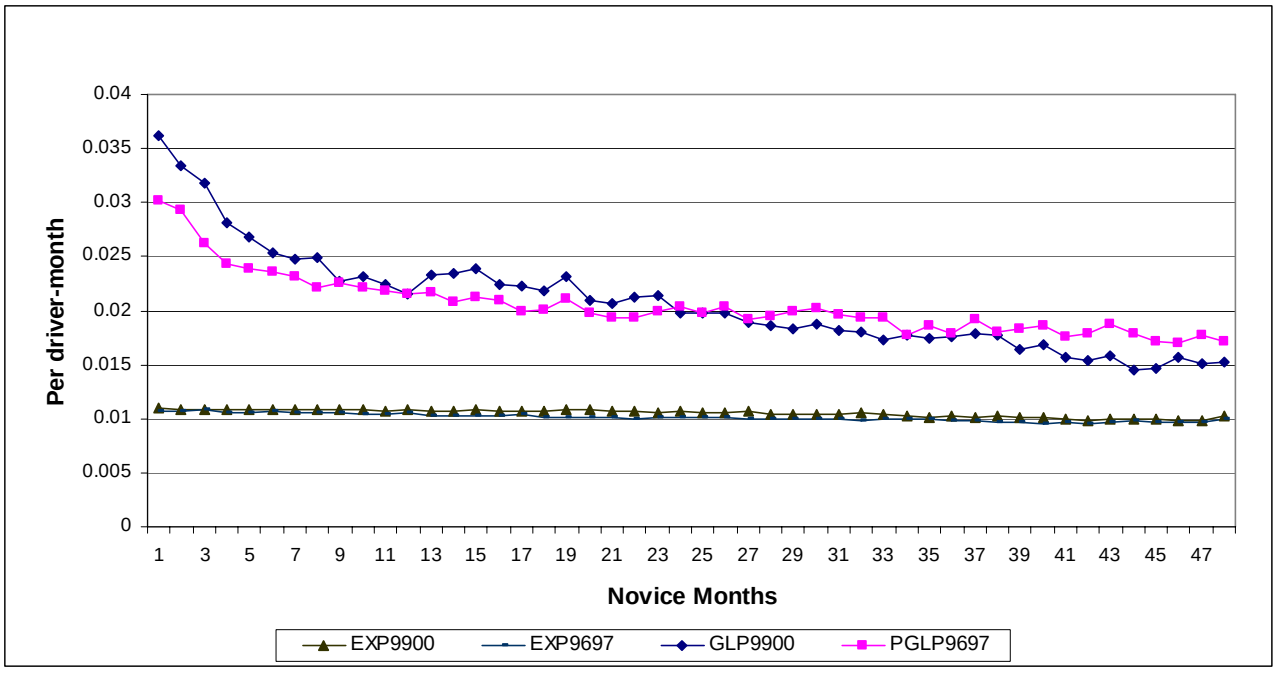
*P < 0.0001 **P < 0.005 ***P<0.05 [1] *CI=Confidence Interval*

Table 42: Estimated Relative Risks of Crash Involvement for Novice Drivers who Graduated out of GLP in each Period of Solo Licensure Compared to Pre-GLP Novice Drivers – Adjusted for Age at Solo Licensure and Gender

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Solo Licensure When Crashes Occurred	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st 2 Years								
Full GLP (2001 – 2002)	0.98 (0.97, 1.01)	**-1%**	0.93 (0.90, 0.96)	**-7%***	0.87 (0.84, 0.91)	**-13%***	1.04 (1.01, 1.07)	**+4%*****
Early GLP (1999 – 2000)	1.02 (0.99, 1.05)	**+2%**	0.93 (0.89, 0.97)	**-7%****	0.83 (0.78, 0.88)	**-17%****	1.10 (1.06, 1.14)	**+10%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.97 (0.94, 1.01)	**-3%**	1.00 (0.96, 1.05)	**+0%**	1.05 (0.98, 1.13)	**+5%****	0.95 (0.91, 0.99)	**-5%*****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years								
Full GLP (2001-2002)	0.97 (0.95, 0.99)	**-3%****	0.95 (0.93, 0.97)	**-5%***	0.86 (0.83, 0.89)	**-14%***	1.02 (1.00, 1.04)	**+2%*****
Early GLP (1999-2000)	1.01 (0.99, 1.03)	**+1%**	0.95 (0.93, 0.97)	**-5%***	0.87 (0.84, 0.90)	**-13%***	1.07 (1.05, 1.09)	**+7%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.96 (0.94, 0.98)	**-4%**	1.00 (0.97, 1.03)	**+0%**	0.98 (0.94, 1.02)	**-2%**	0.95 (0.92, 0.97)	**-5%****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years								
Early GLP (1999-2000)	0.99 (0.98,1.00)	**-1%**	0.96 (0.93, 0.97)	**-4%***	0.89 (0.86,0.91)	**-11%***	1.04 (1.02,1.05)	**+4%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-

*P < 0.0001 **P < 0.005 ***P<0.05 [1]*CI=Confidence Interval*

Figure 2: Monthly Crash Involvement Rates of GLP and Pre-GLP Novice Drivers and Time Matched Experienced Drivers – First Four Years of Solo Licensure



Effect of the Length of the Learner Stage on Novice driver Crash Involvement Rates. One of the primary aims of this study was to determine whether the Novice stage restrictions and components had an impact on the crash rates of Novice drivers. As noted in the previous section, age and gender differences accounted for some of the observed differences between the GLP and Pre-GLP Novice driver crash rates. Another factor that could be influencing these rates is the program's extended Learner stage. As was observed in chapter 4, the length of time spent in the Learner stage had a strong effect on the crash rates of New drivers. As was shown in Table 29, drivers in the GLP Novice driver groups spent considerably more time in the Learner stage than their Pre-GLP counterparts. To explore whether this difference might be influencing the crash rates of the Novice driver groups, several analyses were conducted.

Table 43 shows the percentage difference in the Novice driver crash involvement rates by the length of the Learner stage and by years of solo licensure. All drivers were included in the analysis, regardless of program. In each case the percentage difference in the Novice rate was computed using a Learner time of less than 3 months as the reference category. Prior to GLP, the minimum Learner stage was 30 days (1 month); after GLP it was 6 months (or 3 months for drivers who completed an approved driver education course). Table 44 shows the relative risks of Novice driver crash involvement after adjusting for age, gender, and length of time in the Learner stage.

Table 43: Estimated Percentage Change in Novice Crash Involvement Rates by the Number of Months Drivers Spent in the Learner Stage

Period of Solo Licensure	Length of Learner Stage	% Change in Novice Crash Involvement Rate (from Reference Group)
1st Year	12 months or more	-16%*
	9 - <12 months	-19%*
	6 - <9 months	-5%*
	3 - <6 months	0%
	less than 3 months	(Ref)
1st Two Years	12 months or more	-19%*
	9 - <12 months	-19%*
	6 - <9 months	-5%*
	3 - <6 months	-2%**
	less than 3 months	(Ref)
1st Three Years	12 - <18months	-19%*
	9 - <12 months	-19%*
	6 - <9 months	-7%*
	3 - <6 months	-5%*
	less than 3 months	(Ref)
1st Four Years	12 - <18months	-21%*
	9 - <12 months	-19%*
	6 - <9 months	-8%*
	3 - <6 months	-7%*
	less than 3 months	(Ref)

* P< 0.0001

As shown in Table 43 there was an inverse relationship between the amount of time spent in the Learner stage and the crash involvement rates of Novice drivers; as Learner time increased, Novice crash involvement rates decreased. The relationship was particularly strong as the amount of time spent in the Learner stage increased beyond 270 days (9 months). Based on the categories used in this analysis, however, there does not appear to be much gain in terms of Novice crash rate reductions for drivers who remained in the Learner stage beyond 360 days (12 months). The categorization scheme used in this analysis was quite broad however. In addition, due to the criteria used for the formation of the Novice driver cohorts, only those drivers who progressed through the Learner stage fairly quickly were selected for inclusion (section 5.1.2). This may have limited the ability of this study to detect a Learner effect for longer Learner times. Further research will be required to confirm whether additional time spent in the Learner stage may be beneficial. Interestingly, the relationship between the amount of Learner time and Novice driver crash involvement rates was consistent across all of the lengths of solo licensure considered. What this suggests is that the impact of a longer Learner stage is not only strong and positive, but it is also enduring.

To investigate the extent to which this association between Learner-time and Novice crash rates might be influencing the crash rates of Novice drivers in the GLP and Pre-GLP groups, their relative risks of crash involvement were estimated after adjusting for age, gender and the number of months they spent in the Learner stage. Based on the association observed between the length of the Learner stage and Novice crash rates it was expected that, after this adjustment, the estimated relative risks for the GLP to Pre-GLP comparisons would increase across all categories and groups. And this was the case (see Table 44).

Table 44: Estimated Relative Risks of Crash Involvement for Drivers in their First Four Years of Solo Licensure - Adjusted for Age at Solo LIcensure, Gender and Length of Time Spent in the Learner Stage

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Solo Licensure When Crashes Occurred	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year of Licensure								
Full GLP (2001-2002)	1.21 (1.18, 1.24)	**+21%***	1.21 (1.17, 1.24)	**+21%***	1.06 (1.01, 1.11)	**+6%*****	1.28 (1.25, 1.32)	**+28%***
Early GLP (1999-2000)	1.23 (1.20, 1.26)	**+23%***	1.21 (1.17, 1.25)	**+21%***	1.08 (1.03, 1.13)	**+8%**%**	1.30 (1.26, 1.34)	**+30%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.98 (0.96, 1.00)	**-2%**	0.99 (1.00, 1.05)	**-1%**	0.97 (0.94, 1.01)	**-3%**	0.98 (0.96, 1.01)	**-2%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years of Licensure								
Full GLP (2001 – 2002)	1.12 (1.10, 1.14)	**+12%***	1.13 (1.10, 1.16)	**+13%***	0.99 (0.96, 1.02)	**-1%**	1.19 (1.16, 1.21)	**+19%***
Early GLP (1999 – 2000)	1.18 (1.16, 1.21)	**+18%***	1.16 (1.14, 1.19)	**+16%***	1.04 (1.01, 1.08)	**+4%*****	1.25 (1.22, 1.28)	**+25%***
Pre-GLP (1996 – 1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.95 (0.93, 0.96)	**-5%***	0.96 (0.95, 0.98)	**-4%****	0.94 (0.92, 0.97)	**-6%****	0.95 (0.93, 0.96)	**-5%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years of Licensure								
Full GLP (2001-2002)	1.04 (1.03, 1.06)	**+4%***	1.05 (1.03, 1.07)	**+5%***	0.93 (0.91, 0.96)	**-7%***	1.09 (1.07, 1.11)	**+9%***
Early GLP (1999-2000)	1.08 (1.06, 1.09)	**+8%***	1.07 (1.05, 1.09)	**+7%***	0.98 (0.95, 1.00)	**-2%**	1.13 (1.08, 1.15)	**+13%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-
Contrast:								
Full GLP (2001-2002)	0.96 (0.95, 0.98)	**-4%***	0.98 (0.97, 1.00)	**-2%**	0.96 (0.93, 0.98)	**-4%****	0.97 (0.95, 0.99)	**-3%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years								
Early GLP (1999-2000)	1.03 (1.02,1.04)	**+3%***	1.02 (1.00, 1.04)	**+2%*****	0.93 (0.91, 0.96)	**-7%***	1.07 (1.06,1.08)	**+7%***
Pre-GLP (1996-1997)	1.00 (REF)	-	1.00 (REF)	-	1.00(REF)	-	1.00(REF)	-

*P < 0.0001 **P < 0.005 ***P<0.05 [1] *CI = Confidence Interval*

As shown in Table 44, during the first year of solo licensure, the relative risk after adjustment for the length of the Learner stage was 1.23 for the GLP 1999- 2000 group and 1.21 for the GLP 2001-2002 group. This compares to relative risks of 1.05 and 1.06, respectively, when only age and gender were taken into account. A similar pattern of results were obtained when the analyses were based on the first two years, three years, and four years of solo licensure. However, the magnitude of the effect decreased as the length of solo licensure increased. Thus, although the association between Learner-time and Novice crash involvement rates remained consistent across time periods, once drivers had accumulated more than two to three years of experience as a solo driver, the impact of the association diminished. The results do, however, indicate that the extended Learner stage of GLP may have played an important role in minimizing the crash involvement rates (relative to that of the Pre-GLP group) of Novice drivers. Taken together with the trends described previously, these results suggest that if GLP had not included an extended Learner stage, Novice driver crash rates might have been even higher than observed for GLP drivers – particularly during their first two years of Novice licensure. Moreover, despite the more rapid rate of decline in crash rates for GLP compared to Pre-GLP drivers in their third and fourth years of licensure, the road safety impact of GLP on the longer-term Novice crash rates might have remained slightly negative. In a later section, the impact of submitting a DOC and applying for early Novice licensure on the trends observed here will be discussed.

5.2.5 GLP Testing Processes: Impact, Ease of Passage, and Predictive Value

When GLP was introduced, the first change that was made to the testing processes used to evaluate New drivers was the introduction of new Class 5 (passenger vehicle) and Class 6 (motorcycle) exit road tests. The exit tests could only be taken after a minimum of 18 months in the Novice stage and had to be passed in order for drivers to apply for a Full privilege licence. Between 1998, when GLP was introduced, and the end of 2000, the road tests previously used as Class 5 (or 6) road tests for Pre-GLP drivers were used as the Class 7 (or 8) road tests that GLP drivers were required to take in order to progress into the Novice stage. At the end of 2000, new Class 7 and 8 road tests were introduced, as were the enhanced class 7 and 8 knowledge tests discussed in Study 2. The Class 7 and 8 road tests were developed using the same model and format as the GLP Class 5 and 6 exit tests. A report prepared by the original GLP project team summarizing the model, objectives, development and assessment of both sets of road tests (7/8 and 5/6) is provided in Appendix B. Although estimates of reliability (internal consistency and inter-rater) and validity (concurrent) were made in the development phase of the test, no attempt was made to determine whether passing the test would be associated with lower crash involvement rates (predictive validity). The study conducted to explore issues relevant to the impact of the road tests on Novice driver crashes will be described here. It should be noted, however, that as very few new drivers in the GLP and Pre-GLP cohorts (<1%) obtained a motorcycle licence as their first licence, only the road tests for passenger vehicle licences (Classes7 and 5) were used in the study.

Due to the sequential nature of the implementation of the new tests, it was possible to compare the Early GLP and Full GLP cohorts to ascertain whether taking the new Class 7 test had any impact on Novice driver crash rates. Except for the enhanced knowledge and class 7/8 road test, both groups (Early and Full GLP) were exposed to all the same restrictions and conditions associated with GLP. As shown in chapter 4, no effect on Learner crash rates was found after the implementation of the enhanced knowledge test and, no impact on Novice crash rates would be expected from this test. Thus, a comparison of the crash rates of the two groups of Novice drivers was used to explore whether or not the introduction of the revised Class 7 test had a detectable effect on Novice crash rates. Although it is unknown how long any potential effect of passing the road test might be expected to last, it seems reasonable to assume that as drivers gain experience and exposure as solo drivers the influence of factors other than the test would begin to take precedence. Therefore, it seems unlikely that any effects observed after about two years of licensure would be attributable to testing.

As shown in Tables 41 and 44, during their first year of solo licensure, the relative risks of crash involvement for the Full GLP and Early GLP drivers were generally found to be close to one, indicating no significant difference between the two groups. For the first two and three years of licensure, however, the estimated relative risks indicated lower crash involvement rates for the Full GLP group. Although the lower crash involvement rates of the Full GLP Novice drivers during their second and third years of licensure are encouraging, the lack of an effect during the first year, when the impact of the level 1 road test might have been expected to be most apparent, makes the results difficult to interpret. However, Novice drivers have very high crash rates during the first year of licensure and this may have made it difficult to detect an effect of the test. By the time these drivers have moved into their second year of licensure some of this initial excess risk may start to dissipate and, perhaps, the rate reduction observed over the next two years of licensure could be associated with the test taken by the Full GLP driver group.

Although the findings concerning the impact of the enhanced road test on Novice crash rates were inconclusive, a strong association was observed between performance on the test and crash involvements during the first year of Novice licensure. Drivers from the Full GLP group who passed the test on the first attempt were found to have a 1-year Novice crash rate that was 20% (Relative Risk = 0.80, 95% Confidence Interval: 0.76, 0.84) lower than drivers who took three or more attempts ($P<0.0001$); and drivers who took two attempts to pass were 13% less likely (Relative Risk = 0.87, 95% Confidence Interval: 0.82, 0.92; $P<0.0001$). Unfortunately, due to the lack of data available for the Early GLP group, it was not possible to determine whether the observed association would have been similar with the old test.

To investigate the extent to which the Class 5 exit road test might be predictive of crash involvement for GLP graduates, two analyses were undertaken. Firstly, a comparison of the crash rates of GLP Novice drivers who did and did not obtain their full privilege licence during their first three years of licensure was undertaken. The first three years of solo licensure were selected as the period of primary interest because it provided a reasonable balance between the number of drivers who, by the study cut-off date, were able to accumulate that amount of time, and the time needed for sufficient numbers of drivers to apply for and take their exit test. Secondly, crash rates were examined during the six months before and after Novice drivers obtained their Full Privilege licence.

About 38% of the GLP drivers with three years of solo licensure graduated to a Full privilege licence by the end of their third year. Unfortunately, the results obtained from the Poisson regression analyses used to compare the age and gender-adjusted rates of the drivers were inconsistent. When all crashes and material damage only crashes were modelled, drivers who got their Full privilege licence were found to have relative risks greater than one (RR=1.05 and 1.09, respectively; $P<0.0001$), indicating higher adjusted rates than drivers who had not obtained Full privilege licensure. When only 'liable' and casualty crashes were considered the results were reversed: drivers who got their Full Privilege licence had lower estimated rates than drivers who did not (RR=0.96 and 0.96, respectively; $P<0.03$). The inconsistency of the results makes the findings difficult to interpret. However, this very inconsistency suggests that no stable and substantial effect likely occurred.

In the second analysis, the crash involvement rates of GLP graduates were compared during the first six months before and after they obtained their full privilege licence. Using a McNemar's test for comparing proportions for paired groups, a small (about 6%) and marginally significant ($P<0.03$) reduction in the overall crash rate for drivers after passing the test was observed. Unfortunately, it was not possible to identify a comparison group for the drivers used in these analyses so, although the findings are suggestive, it is possible that the results are due to factors other than the test itself.

To investigate whether an association similar to the one obtained between performance on the Class 7 road test and the crash involvement rates of Novice drivers would be observed for the Class 5 road test, another set

of Poisson regressions were used to model the crash involvement rates of GLP graduates by the number of times they had to take the exit test before they passed it. For these analyses, all of the drivers in the Full GLP cohort who had accumulated 180 days of Full privilege licensure by the end of June 2005 were selected. Crashes that occurred during that period of time were counted and 180-day crash involvement rates were computed and compared for drivers who passed the Class 5 test on the first or second attempt or who took 3 or more attempts. Of the 25,567 drivers included in the analysis, 22,463 (88%) passed on the first attempt, 2,794 (11%) passed on the second attempt, and 310 (1%) took three or more attempts to pass.

Interestingly, a strong association was observed between passing the road test on the first attempt and the age at which the selected GLP graduates obtained their Full privilege licence ($P<0.0001$). A higher percentage of the younger drivers passed on the first attempt than older drivers. Almost all of the 17 year old drivers (99%) in this analysis who had obtained their Full privilege licence passed the road test on the first attempt compared to 90% of the 18 year olds, 86% of 19-21 year olds, and 78% of drivers 22 years of age or older. Gender was likewise found to be associated with performance on the test ($P<0.0001$), although the magnitude of the difference between them was less pronounced; a higher percentage of females (89%) than males (87%) passed the test on the first attempt.

After adjusting for these age and gender differences in test performance, an estimated relative risk of 0.77 was obtained indicating a lower crash involvement for drivers who passed the test on the first attempt than those who took three or more attempts. A relative risk of 0.78 was obtained for those who passed the test on the second attempt. Thus, in both cases drivers who passed the test with relative ease (first or second attempt) were found to have lower crash rates than those who found the test more difficult. While suggestive of an effect, the results did not achieve statistical significance ($P>0.05$ in both cases).

One factor not taken into account in the abovementioned analysis, however, was the length of time that drivers had been licensed (as a Learner and Novice) before obtaining their Full Privilege licence. Once length of prior licensure was accounted for, the relative risks of crash involvement for the drivers who passed on the first and second attempts, relative to those who took three or more tries, were reduced to 0.72 and 0.76 respectively. Drivers who passed on the first or second attempt tended to have shorter periods of prior licensure than drivers who took three or more attempts. Finding lower relative risks for crash involvement after taking into account these differences in prior licensed driver- time suggests that the length of the Learner and Novice stages influenced the relationship between ease of passing the road test and drivers' crash involvement rates. After excluding the effect of the length of prior licensure, drivers who took fewer attempts to pass the Class 5 road test had even lower estimated crash involvement rates during their first 180 days of Full privilege licensure than drivers who took 3 or more attempts. However, only the results obtained for the drivers who passed on the first attempt were found to be statistically significant ($P<0.02$).

To see if performance on the enhanced Class 7 knowledge and new Class 7 road test might combine with the performance on the Class 5 road test to produce an even more pronounced effect on the 180-day crash rates of the Full GLP graduates, the regressions were rerun with the number of attempts on each test added into the model. When this was done and the results obtained, the estimated relative risk for the drivers who passed the Class 5 test on the first attempt or second attempt was 0.75 ($P<0.04$) and 0.78 ($P>0.05$), respectively. The magnitudes of the relative risks differed little from those obtained when only performance on the Class 5 test was used in the model. Clearly performance on the earlier tests added little to the predictive value of the exit road test. All in all, drivers who passed the exit test on their first or second attempt had crash rates that were about 22-28% lower than drivers who took more attempts to pass. More research is needed to understand factors that may play an important role in increasing the likelihood that drivers will pass the road test on the first attempt.

In a final analysis, drivers from the Early GLP group were selected for inclusion in an analysis designed to investigate whether taking the new Class 7 road test might contribute, through a practice effect, to higher pass

rates for drivers taking the GLP exit test. As mentioned above, the new Class 7 test was modelled after the GLP Class 5 exit test. Consequently, although not as lengthy or comprehensive, it used the same format and had similar expectations. It was not possible to compare performance on the old test, however, as historical records of attempts were not kept for any tests that were passed prior to the introduction of the new test.

Of the 56,880 drivers included in the analysis, 45% took the new Class 7 test and 55% took the old Class 7 test. The results indicated that performance on the Class 5 test was associated with whether or not drivers took the new versus the old Class 7 test (Chi-square = 456.46, df=2, P<0.0001) A significantly higher percentage of drivers who took the new rather than the old test passed the Class 5 exit test on the first attempt (88% versus 82%). While certainly indicative of a practice effect, the findings also suggest that, despite the intent that Class 5 test to be harder and more advanced in what it covers, the high percentage of first time passes suggests that the two tests may not, in fact, be measuring elements that are all that different.

Although the findings reported above are interesting, they must be interpreted with caution. The drivers selected for inclusion in the analyses may not be representative of the broader group of GLP drivers who may obtain their Full Privilege licence. Due to the study time frame and the criteria used to select the drivers, a bias towards drivers who passed the test more easily may have been introduced. To be included in the sample, drivers had to obtain their Full privilege licence within a relatively short period of time. Therefore, drivers who may have struggled with the test and not obtained their full privilege licence may not have had time to retake and pass the test before the study cut-off date. Until more of the drivers in the cohort have had time to obtain their full privilege licence the results the generalizability of the findings is limited. Also, the methods used do not permit drawing causal connections between ease of performance on the tests and crash involvement rates. Other factors not taken into account in this research may also play a role. Similarly, although some relationships were found for drivers before and after they took the exit road test, the absence of an appropriate comparison group makes it difficult to know if the observed changes were due to the road test or to some other as yet unidentified factors.

5.2.6 The ICBC-Approved Driver Education Program, Early Novice Licensure, and Novice Crash Involvement Rates

Although not an actual GLP component, the ICBC-approved driver education curriculum was developed and implemented concurrently with GLP and became an integral part of the licensing process for many New drivers. The course was not mandatory but drivers who completed an approved course and submitted a declaration of completion (DOC) were permitted to apply for up to a 3-month reduction in the time they were required to spend in the Learner stage. This meant that they were able to advance from the Learner stage with as little as 90 days of Learner time. When the approved course was first introduced in 1998 it was assumed that the benefits from a well developed and comprehensive driver education curriculum would be sufficient to outweigh any potentially detrimental effects of a Learner time discount. The results of the year 3 interim evaluation suggested that this belief was likely unfounded; drivers who completed the course and applied for the time credit had a 26% higher 1-year Novice crash rate than drivers who did not.

The results of the year 3 evaluation were concerning but they were also preliminary; they had been obtained on a cohort of drivers who had entered the licensing process in the first year of GLP (i.e., before GLP was fully implemented) and before the approved course became well established or accessible. Given these limitations, it was recommended that although the time credit be considered for removal, more research was needed in order to determine whether similar effects would be obtained with drivers who entered GLP after the course had been more generally disseminated, and after GLP had been fully implemented.

Tables 45 and 46 provide the age and gender distributions of the Early and Full GLP Novice driver groups who either did or did not submit a DOC before taking their first (Class 7 or 8) road test.

About 78% of the DOC Novice groups and 72% of the No DOC Novice groups were aged 16 when they obtained their first Learner licence. Comparisons of the DOC and No DOC groups across the two GLP programs indicated that the patterns in the distributions were very similar, although there was a slightly lower percentage of 16 year olds and higher percentage of 17-21 year olds in the Full GLP No DOC group than in the Early GLP No DOC group. However, given the nature of the components added to GLP with full implementation, it is unlikely that this slight shift in the age distribution of the drivers was a program effect.

Table 45: Age at First Solo Licence for GLP Novice Driver Groups by DOC Status

Age at First Solo Licence (in years)	Early GLP 1999-2000				Full GLP 2001-2002			
	DOC		No DOC		DOC		No DOC	
	N	%	N	%	N	%	N	%
16	11,253	66.6	14,910	38.3	12,637	64.4	11,511	32.4
17	2,627	15.5	13,532	34.7	3,398	17.3	13,269	37.4
18	872	5.2	3,135	8.1	1,205	6.1	3,505	9.9
19-21	827	4.9	2,729	7.0	1,090	5.6	3,269	9.2
22-24	255	1.5	1,032	2.7	263	1.3	979	2.8
>= 25	1,074	6.3	3,610	9.3	1,020	5.2	2,997	8.4
Total	16,907	100.0	38,948	100.0	19,613	100.0	35,530	100.0

**Chi-Square = 3,921.8, df=5, P<0.0001)* *+Chi-Square = 5,348.2, df=5;P<0.0001)*

Table 46: Gender for GLP Novice Driver Groups by DOC Status

Gender	Early GLP 1999-2000*				Full GLP 2001-2002+			
	DOC		No DOC		DOC		No DOC	
	N	%	N	%	N	%	N	%
Male	8,673	51.3	20,251	52.0	10,092	51.5	19,050	53.6
Female	8,234	48.7	18,693	48.0	9,521	48.5	16,478	46.4
Unknown	1	0.0	4	0.0	0	0.0	2	0.0
Total	16,908	100.0	38,948	100.0	19,613		35,530	100.0

**Chi-Square = 2.33, df=1, P<0.13 (missing cases excluded)* *+Chi-Square = 23.75, df=1; P<0.0001 (missing cases excluded)*

Characteristics of Novice Crash Involvements by DOC status. The crash involvements of GLP Novice drivers who submitted a DOC prior to their first road test were compared with those who did not submit a DOC to see if there were any significant differences in the relative frequencies of liable or casualty crash involvements across Novice driver groups (Early or Full) and periods of licensure. Only the crash involvements that occurred within the first two years of solo licensure were slightly more heavily weighted towards casualty involvements for the No DOC group than for the DOC group. However, the magnitude of the difference was quite small (27.9% versus 29.1%; P<0.05).

A significantly higher percentage of the crash involvements of the DOC group (for both the Early and Full GLP drivers) than the No DOC group were classified as liable (66.9% and 65.0%, respectively, for the Early group, P<0.01); and 67.7% and 66.0%, respectively for the full GLP group, P<0.05). Once again, however, the magnitudes of the differences between the percentages were quite small.

Effect of DOC submission and Early Novice Licensure on GLP Novice Driver Crash Rates. Tables 47 and 48 summarize the crash involvement rates by DOC status for all GLP drivers, as well as for those who graduated to a Full privilege licence during their first four years of solo licensure. In both cases, the rates for the DOC groups are substantially higher than for the No DOC groups, and remain substantially higher all of the periods of licensure examined. They do, however, decline over time. This can be seen most clearly in Figure 3 which shows the monthly crash rates computed for the two groups. Although the rates do start to converge after about two years of licensure, and are quite similar by the end of the fourth year, the overall decline is not sufficient to negate the high rates observed in the earlier years.

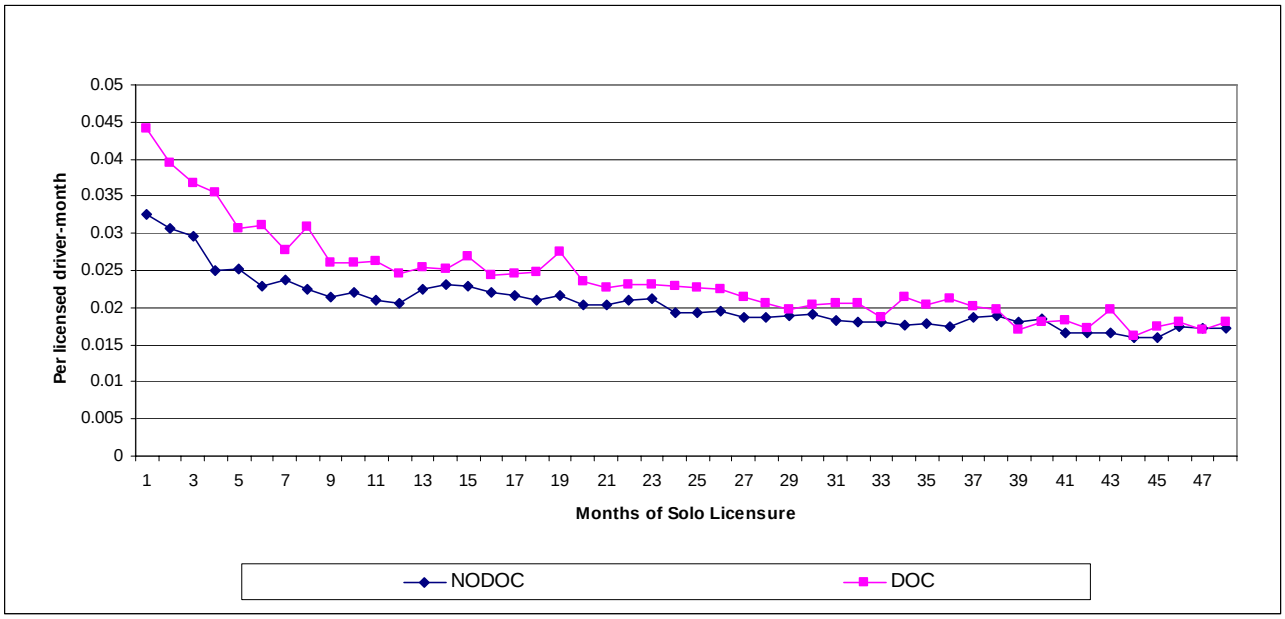
Table 47: GLP Crash Involvement Rates by Program, DOC Status, and Years of Solo Licensure

Type of Crash by Period of Licensure	Early GLP (1999 – 2000)		Full GLP (2001 – 2002)	
	DOC	No DOC	DOC	No DOC
All Crashes:				
1st Year	38.08 (37.44-38.72)	29.95 (29.55-30.35)	38.02 (37.38-38.66)	29.58 (29.19-29.97)
1st Two Years	34.22 (33.79-34.65)	28.27 (27.99-28.55)	33.08 (32.66-33.50)	26.92 (26.66-27.18)
1st Three Years	31.59 (31.22-31.96)	26.61 (26.37-26.85)	30.66 (30.30-31.02)	25.94 (25.70-26.18)
1st Four Years	29.25 (28.86-29.64)	25.26 (25.00-25.52)	-	-
Liable Crashes:				
1st Years	25.48 (24.96-26.00)	19.46 (19.14-19.78)	25.72 (25.20-26.24)	19.53 (19.21-19.85)
1st Two Years	21.35 (21.01-21.69)	17.31 (17.09-17.53)	20.97 (20.63-21.31)	16.91 (16.70-17.12)
1st Three Years	18.88 (18.59-19.17)	15.69 (15.50-15.88)	18.62 (18.34-18.90)	15.66 (15.47-15.85)
1st Four Years	16.92 (16.62-17.22)	14.45 (14.26-14.64)	-	-
Casualty Crashes:				
1st One Year	10.61 (10.28-10.94)	8.67 (8.46-8.88)	10.77 (10.43-11.11)	8.44 (8.23-8.65)
1st Two Years	9.61 (9.38-9.84)	8.16 (8.01-8.31)	9.24 (9.02-9.46)	7.84 (7.70-7.98)
1st Three Years	8.87 (8.67-9.07)	7.73 (7.60-7.86)	8.42 (8.23-8.61)	7.53 (7.40-7.66)
1st Four Years	8.19 (7.98-8.40)	7.31 (7.17-7.45)	-	-
Material Damage Only Crashes:				
1st Year	27.47 (26.93-28.01)	21.27 (20.94-21.60)	27.25 (26.71-27.79)	21.14 (20.81-21.47)
1st Two Years	24.61 (24.24-24.98)	20.11 (19.88-20.34)	23.85 (23.49-24.21)	19.07 (18.85-19.29)
1st Three Years	22.72 (22.40-23.04)	18.89 (18.68-19.10)	22.24 (21.93-22.55)	18.41 (18.21-18.61)
1st Four Years	21.05 (20.72-21.38)	17.96 (17.74-18.18)	-	-

Table 48: GLP Crash Involvement Rates by Program, DOC Status, and Years of Solo Licensure – for Drivers who Graduated out of GLP During the Specified Period of Licensure

Type of Crash by Period of Licensure	Early GLP (1999 – 2000)		Full GLP (2001 – 2002)	
	DOC	No DOC	DOC	No DOC
All Crashes:				
1st Two Years	33.88 (33.32-34.44)	28.43 (28.04-28.82)	32.81 (32.27-33.35)	26.83 (26.46-27.20)
1st Three Years	33.10 (32.53-33.67)	28.16 (27.74-28.58)	31.02 (30.48-31.56)	26.80 (26.40-27.20)
1st Four Years	30.92 (30.38-31.46)	27.09 (26.69-27.49)	-	-
Liable Crashes:				
1st Two Year	20.58 (20.15-21.01)	16.74 (16.44-17.04)	19.96 (19.54-20.38)	16.14 (15.85-16.43)
1st Three Years	18.77 (18.34-19.20)	15.62 (15.31-15.93)	18.18 (17.77-18.59)	15.49 (15.18-15.80)
1st Four Years	17.15 (16.75-17.55)	14.79 (14.50-15.08)	-	-
Casualty Crashes:				
1st Two Years	9.14 (8.85-9.43)	7.75 (7.55-7.95)	8.78 (8.50-9.06)	7.46 (7.26-7.66)
1st Three Years	8.73 (8.44-9.02)	7.44 (7.22-7.66)	8.19 (7.91-8.47)	7.42 (7.21-7.63)
1st Four Years	8.22 (7.94-8.50)	7.38 (7.17-7.59)	-	-
Material Damage Only Crashes:				
1st Two Years	24.73 (24.25-25.21)	20.68 (20.34-21.02)	24.03 (23.57-24.49)	19.37 (19.06-19.68)
1st Three Years	24.37 (23.88-24.86)	20.72 (20.36-21.08)	22.83 (22.37-23.29)	19.37 (19.03-19.71)
1st Four Years	22.70 (22.23-23.17)	19.70 (19.36-20.04)	-	-

Figure 3: Monthly Crash Involvement Rates Novice Drivers During their First Four Years of Solo Licensure by Whether or not they Submitted a Declaration of Completion (DOC) for an ICBC-Approved Driver Education Course



None of the rates shown in Tables 47 and 48 or in Figure 3 were adjusted for age and gender differences between the groups. As noted previously, a significantly higher percentage of DOC drivers in both the Early and Full GLP groups were younger than in the No DOC groups, and there was a higher percentage of males in the Full GLP group of DOC drivers. Table 49 shows the results of the relatives risks obtained from the regression analyses conducted to determine whether or not submitting a DOC had an impact on the GLP Novice driver crash involvement rate after adjustment for age and gender. The estimated relative risks for the drivers who graduated to a Full privilege license during each period of licensure are provided in Table 50.

Whether all Novices or just those who graduated out of GLP were included in the analyses, the results were consistent: drivers who submitted a DOC and applied for early Novice licensure had significantly higher crash rates than those who did not – even after taking into account the differences in the age and gender distributions of the two groups. Moreover, this effect was consistent whether drivers entered the Early GLP licensing process or the Full licensing process. There was, however, evidence of a possible implementation effect on the crash rates of Novice drivers in their second and third years of licensure. Drivers in the Full GLP group had significantly lower crash involvement rates than drivers who entered in Early GLP. The magnitudes of the difference in estimated rates were, however, relatively small (from about 2% to 5%). Nonetheless, although the effect was small, full program implementation, including the improvements made in the standards and dissemination of the approved driver education course, was found to be associated with lowering of the Novice driver crash rate. No significant interaction effects were observed between membership in the Full GLP or Early GLP group and DOC status. Thus, if there was an implementation effect it did not appear to benefit the DOC or No DOC differentially.

The high rates of the DOC drivers during the first two years of Novice licensure (Figure 3) also help to explain the elevated risks observed for all GLP Novice drivers in relation to the Pre-GLP Novice driver group (Figure 2). Although the DOC group only comprises about a third of the total GLP Novice group, the very high rates associated with these drivers appears to be pulling the whole group's rates upwards. A comparison of the No DOC group's rates to the rates shown in Figure 2 for the Pre-GLP group shows that the two groups are quite similar – at least until the rate of decline for the GLP drivers starts to escalate. Thus, while external or other factors may also be impacting GLP Novice driver rates, it would appear that one of the key factors is submission of a DOC. The extent to which the DOC effect is influenced by early Novice licensure is explored below.

Table 49: Estimated Relative Risks of Crash Involvement for GLP Drivers by Program, DOC status, and Period of Solo Licensure – Adjusted for Age at Solo Licensure and Gender

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Solo Licensure When Crashes Occurred	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st Year								
Full GLP (2001-2002)	0.98 (0.96, 1.00)	**-2%**	1.00 (0.97, 1.02)	**+0%**	0.98 (0.94, 1.02)	**-2%**	0.99 (0.96, 1.01)	**-1%**
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
DOC	1.26 (1.24, 1.29)	**+26%***	1.30 (1.26, 1.33)	**+30%***	1.25 (1.20, 1.30)	**+25%***	1.27 (1.24, 1.30)	**+27%***
NO DOC	1.00 (REF	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 2 Years								
Full GLP (2001-2002)	0.95 (0.93, 0.96)	**-5%***	0.97 (0.95, 0.99)	**-3%****	0.95 (0.92, 0.98)	**-5%****	0.95 (0.93, 0.97)	**-5%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
DOC	1.21 (1.19, 1.23)	**+21%***	1.23 (1.21, 1.26)	**+23%***	1.19 (1.15, 1.23)	**+19%***	1.22 (1.20, 1.24)	**+22%***
NO DOC	1.00 (REF	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years								
Full GLP (2001-2002)	0.96 (0.95, 0.98)	**-4%***	0.98 (0.96, 1.00)	**-2%**	0.96 (0.93, 0.98)	**-6%****	0.97 (0.95, 0.98)	**-3%****
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
DOC	1.18 (1.16, 1.20)	**+18%***	1.19 (1.17, 1.22)	**+19%***	1.15 (1.11, 1.18)	**+15%***	1.19 (1.17, 1.21)	**+19%***
NO DOC	1.00 (REF	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years								
[Early GLP drivers only]								
DOC	1.14 (1.12, 1.16)	**+14%***	1.16 (1.13, 1.19)	**+16%***	1.12 (1.09, 1.16)	**+12%***	1.15 (1.13, 1.18)	**+15%***
NO DOC	1.00 (REF	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-

*P < 0.0001 **P < 0.005 ***P<0.05 [1]***CI=Confidence Interval***

Table 50: Estimated Relative Risks of Crash Involvement by DOC Status for Novice Drivers who Graduated out of GLP in each Period of Solo Licensure – Adjusted for Age at Solo Licensure, Gender, and Licensing Program (Early versus Full GLP)

	All Crashes		Liable Crashes Only		Casualty Crashes Only		Material Damage Only	
Period of Solo Licensure When Crashes Occurred	**Relative Risk (95% CI[1])**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**	**Relative Risk (95% CI)**	**% Difference (from Reference Group)**
1st 2 Years								
Full GLP (2001-2002)	0.96 (0.93, 0.99)	**-4%*** **	0.99 (0.94, 1.03)	**-1%**	1.04 (0.97, 1.11)	**+4%**	0.93 (0.90, 0.97)	**-7%*** **
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
DOC	1.23 (1.18, 1.27)	**+23%***	1.24 (1.19, 1.30)	**+24%***	1.23 (1.14, 1.31)	**+23%***	1.23 (1.18, 1.28)	**+23%***
NO DOC	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 3 Years								
Full GLP (2001-2002)	0.94 (0.92, 0.97)	**-6%***	0.98 (0.95, 1.01)	**-2%**	0.97 (0.93, 0.99)	**-3%**	0.94 (0.91, 0.96)	**-6%***
Early GLP (1999-2000)	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
DOC	1.19 (1.16, 1.22)	**+19%***	1.21(1.17, 1.24)	**+21%***	1.18 (1.12, 1.23)	**+18%***	1.19 (1.16, 1.23)	**+19%***
NO DOC	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-
1st 4 Years								
[Early GLP drivers only]								
DOC	1.15 (1.13, 1.18)	+15%*	1.17 (1.13, 1.21)	+17%*	1.14 (1.09, 1.20)	**+14%***	1.16 (1.13, 1.19)	**+16%***
NO DOC	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-	1.00 (REF)	-

*P < 0.0001 **P < 0.005 ***P<0.05 [1]***CI=Confidence Interval***

A factor that was found to be important in the year 3 evaluation of the DOC effect was the policy of permitting DOC drivers to apply for early Novice licensure. As was reported in chapter 4, the length of time spent in the Learner stage was found to have a strong inverse relationship with Novice driver crash involvement rates. Therefore, in an effort to account for the potentially confounding effects of this factor, the relative risks summarized in Table 50 were re-estimated with the length of the Learner stage included as a control variable. When the amount of Learner time was taken into account, the estimated relative risks were much smaller than they were before this variable was included. Across the periods of licensure and types of crashes, the adjusted relative risks (and 95% confidence intervals) obtained after adjustment for age, gender, and length of the learner stage ranged from 1.14 (1.11, 1.17), for the first year of solo licensure, to 1.09 (1.07, 1.11), for the first two years, 1.08 (1.06, 1.11) for the first three years, and 1.05 (1.02, 1.07) for the full four years of licensure. Although the estimated relative risks were smaller after adjustment for the length of the learner stage, they were still greater than one indicating that the adjusted rates for DOC drivers remained higher than the rates for No DOC drivers, but this was weighted heavily by the pattern of very high rates for the DOC in the first two years of solo licensure. Of course statistical adjustment only provides an estimate of what might be expected under a specified set of conditions and assumptions. A more accurate analysis would require comparisons of DOC and No DOC drivers who actually spent similar amounts of time in the Learner stage. Such an analysis will not be possible, however, until the Learner time discount has been removed as an incentive for participation in ICBC's approved driver education course.

As indicated above, even after adjusting for the effect of differences in Learner time the estimated relative risks of crash involvement for DOC drivers remained greater than one, and the effect was particularly strong in the first year of licensure. Although the length of the Learner stage is clearly an important factor, further research is required to better understand and identify what other factors may be contributing to the higher crash rates associated with the DOC group. A survey study undertaken as part of the year 3 evaluation failed to find evidence to suggest that the amount and type of driving undertaken by DOC and No DOC drivers is a major factor, and these results were confirmed recently in a similar study undertaken in Ontario. Despite these findings, more research is needed into the role of driving exposure. Most of the research done to date has relied on self-report data collected several months after driver education may have been completed. In addition, although such measures may provide reasonable estimates of exposure in the near past, it is quite possible that the self-reported estimates may not reflect the actual exposure at the time the drives were involved in the crashes. The very event of a crash could influence exposure. Clearly, something is contributing to the higher rates of drivers observed for the drivers who completed the approved course. It could be something in the nature or delivery of the course itself, the curriculum, or some as yet unidentified characteristics of the drivers who take such a course. One of the primary factors that New drivers who responded to the year 3 survey said contributed to their decision to take an approved driver education course was so that they would be eligible for early licensure. Due to the way in which the samples for the present study were selected, the drivers who were included in this study were those who tended to be the most motivated to move through the licensing process the most quickly, in both the DOC and NoDOC driver groups. Even so, the rates for DOC drivers remained higher. This does not mean that motivation to drive unsupervised quickly is not an important factor. It clearly is. But it suggests there is likely something more contributing to the finding of higher crash rates for DOC drivers than simply speed of licensure. It could be the amount of time they practice driving on the road, or the use of a compressed learning approach, personality characteristics of drivers, poor implementation or delivery of the curriculum or issues relating to content.

It should be noted that the findings reported here are not unusual. Other evaluations of driver education programs from many different jurisdictions have reported similar findings. And no one has yet found an adequate explanation. More research into the role, purpose, content, and delivery of driver education is required. New technologies need to be investigated, and more needs to be done to better understand the driver characteristics, and motivations, that contribute to the paradoxical findings associated with driver education. In the meantime, it is clear that offering early solo licensure to New drivers who take driver education is not warranted. This is not to say that participation in driver education should not be encouraged. But any incentives that are offered to promote such participation must be designed to motivate safe driving behaviours and not simply to motivate earlier mobility.

One final factor investigated in this study was performance on the Class 7 road test and its relationship to the Novice driver crash involvement rates of GLP drivers who did and did not submit a DOC. Crash rates observed during the first year of solo licensure for the Full GLP group were used in the analysis. Of the 55,143 drivers in the cohort, 55,108 (99.9%) had complete Class 7 knowledge and road test data and were included in the analysis. The remaining 35 had either obtained a motorcycle licence (n=23) as their first Novice licence or had missing data. Of the 55,108 drivers in the group, 36% had submitted a DOC and 64% had not.

When performance on the Class 7 road test was examined by DOC status a strong and statistically significant ($P<0.0001$) association was obtained. A much higher percentage of DOC drivers passed their road test on the first attempt than No Doc drivers (75% versus 62%, respectively). A Poisson regression analysis undertaken to investigate the relationship between DOC status, test performance and Novice driver crash involvements produced an estimated relative risk (95% confidence interval) of 1.08 (1.04, 1.13) for DOC relative to No DOC drivers after age, gender, length of the Learner stage, and performance on the Class 7 road test were included in the model. This compared to a relative risk of 1.14 obtained for DOC versus No DOC drivers when performance on the Class 7 test was not taken into account. Within the same model, drivers who passed the road test on the first attempt were found to have relative risks of crash involvement of 0.69 (0.66, 0.73) when compared to drivers who took three or more attempts to pass the test. Thus, drivers who passed the test on the first try were estimated to have adjusted crash rates that were about 30% lower than drivers who had more difficulty passing the test. Although the DOC group had a high percentage of drivers who passed on the first attempt, the detrimental effect of their shorter time in the Learner stage may have outweighed some of the benefits gained by their better test performance.

5.3 Summary

The results of this study suggest that more work is needed to improve the crash outcomes associated with Novice drivers, particularly during their first two years of solo licensure, and particularly in relation to drivers who complete the approved driver education course. Much of this effect appears to be associated with early Novice licensure. Removal of the time incentive as a way to promote participation in driver education would, therefore, be expected to attenuate at least some of the DOC effect. And should this occur, the overall GLP Novice crash rates will most likely also come down. Another, albeit unintended, factor contributing the finding of higher crash rates for GLP Novice drivers is the higher percentage of younger drivers in the GLP groups. The implementation of GLP appears to have prompted new drivers to apply for licensure sooner. This trend will continue to be monitored as drivers proceed into the even longer enhanced program (GLPe).

The findings of this study confirmed the preliminary results reported in the year 3 evaluation and helped to clarify the relationships, both short- and longer-term, between DOC status, the length of the Learner stage and Novice driver crash involvements. Until the time incentive is removed, the crash rates of GLP Novice drivers will likely remain elevated – at least during the early stages of solo licensure. The results of this study demonstrated the effect of an extended Learner stage and confirmed the importance of not reducing the time spent by new drivers in this low risk, supervised stage.

This study also explored questions that arose concerning the possible effect of the staged implementation of GLP; the Novice crash rates of drivers in the Early GLP (1999-2000) group were compared to those who entered the fully implemented program (Full GLP group: 2001-2002). Some significant differences were observed although there was some inconsistency in the direction of the differences, and this made interpretation difficult. If there was an effect, it wasn't detected until the second and third years of Novice licensure. The differences between the two groups during the first year of licensure were not statistically significant. Given that the two most substantial additions to Full GLP were the enhanced knowledge test and the new level 1 (Class 7/8) road test, an indication of an effect was expected during the first year of solo licensure. It is possible that the benefits of the enhanced level 1 road test were masked within the context of the very high crash rates of Novice drivers in this period, or by the confounding influences of differences in lengths of licensure and DOC status. Why GLP Novice drivers were found to have higher crash rates than Pre-GLP drivers during this first year is not yet fully understood. The speed with which many of the drivers in this

study progressed through the Learner stage was likely an important factor, as was the high percentage of drivers who submitted a DOC and took advantage of the opportunity for early Novice licensure.

Although little consistent evidence of predictive validity for crash involvement was obtained for the level 1 test, another aim of this study was to examine the predictive validity of the level 2 (Class 5/6) exit road test. Although some encouraging results were obtained, methodological issues made the results difficult to interpret.. A comparison of crash rates of drivers six months before and after they passed the exit test were compared. A positive effect was observed, but the magnitude was small and the lack of an appropriate comparison group makes it impossible to draw any causal connections. Thus, while the findings are suggestive, other factors could be responsible for the observed effects.

An analysis was also done to compare the crash rates of GLP Novice drivers who did and did not obtain their full privilege licence during their first three years of licensure. Although positive effects were observed for drivers who took the test when liable and casualty crashes were examined, the magnitudes of the observed differences were quite small, opposite results were obtained when all crashes and material damage only crashes were examined and, consequently, the results were difficult to interpret. Nonetheless, taken together with the finding of declining crash rates for GLP Novice drivers in their fourth year of licensure (when more drivers had successfully completed the test), the road test cannot be excluded as a possible factor contributing to the decline.

In addition to comparing the crash rates of drivers who did and didn't pass the road test, the number of attempts taken to pass the exit test was also examined. As with the level 1 test, after adjustment for age, gender, and length of licensure, drivers who passed the exit test without much difficulty (i.e., on the first or second attempt) were found to have lower crash rates than drivers who took three attempts or more. An interesting additional result was that a significantly higher percentage of drivers who took the new Class 7 road test passed the Class 5 road test on the first attempt than drivers who took the old Class 7 test (88% and 82%, respectively). This suggests that there may have been a practice effect for drivers who were exposed to both of the new tests. The very percentage of drivers who passed the Class 5 test on the first attempt also suggests, however, that the level 1 and exit road test may be measuring many of the same elements.

The finding of negative road safety benefits for drivers who completed an approved driver education course should not necessarily be attributed to the course itself. Many factors may have influenced these results. The difference between the study groups in the lengths of their learner stages is certainly a key factor. But other factors such as driver motivation, attitude, parental involvement and amount and type of driving were not investigated. Although amount and type of driving have been investigated elsewhere and have not been yet been found to explain the association between driver education and Novice crash involvement (Wiggins, 2004; Lonero et.al., 2001; Zhao et. al., 2005) more research is still required to measure and better understand relationships between driver education and other potentially confounding factors. There could also be issues in the implementation, content, and delivery of the approved course. More research is required to evaluate the extent to which the approved course curriculum is being implemented and taught to an appropriate standard. In the absence of such research, no causal inferences can be drawn about the impact of the ICBC-approved course on Novice crash involvement rates. However, the results of this study do clearly indicate that promoting participation in the course by offering to shorten the Learner stage has been counterproductive; the observed effect of DOC submission on the crash rates of the Novice drivers included in this evaluation was consistent with the results reported in the year 3 evaluation report, and there was no evidence of a reversal of effect after full implementation of GLP.

Based on the results of the preliminary Year 3 Evaluation (Wiggins, 2004), several recommendations were made for changes to improve the effectiveness of GLP. The recommendations included: 1) to extend the Learner stage, 2) to implement additional Novice conditions and restrictions, and 3) to consider removal of the Learner stage time discount for drivers who completed an ICBC-approved driver education course. The first two recommendations were implemented in October 2003, and the third is ongoing. One question that arose in connection with the implementation of the enhancements was what effect the Learner time discount would

have on the crash involvement rates of Novice drivers when they were required to spend an additional 6 months in the Learner stage. In the next chapter, the study undertaken to explore the early effects of the October 2003 program enhancements is described. The assessment of the impact of the Learner time discount within the context of the extended Learner stage will be the primary focus of Chapter 6.

6. Study 3 - Early Effects of GLPe on New and Novice Driver Crash Rates

Study 1 was conducted primarily to provide historical context, to ensure that the results of the year 3 interim evaluation were not an artefact of the selected study groups, and to examine the impact of the fully implemented program on New driver crash involvement rates, particularly in relation to ICBC's approved driver education course.

The results of the studies describe in chapters 4 and 5 of this report (Study 1 and Study 2) confirmed that GLP was effective in reducing the crash involvement rates of New drivers. They also demonstrated that the positive effect was consistent during both the early program years (1999- 2000) and after GLP had been fully implemented (2001-2002). Some evidence of a program implementation effect was found, although the magnitude of the effect was small (2%-5%); the 2-year and 3-year crash involvement rates of drivers who entered the program after full implementation were lower than the comparative rates obtained for drivers in the early program. Similar results were not observed for the 1-year rates. Given that the main components that were added to GLP in 2000 (new knowledge test and level 1 road test) these results suggest that if the new level 1 road test did have a positive impact, it was a delayed effect.

The results of Study 2 also confirmed that drivers who completed an approved driver education course and submitted a DOC had higher Novice crash involvement rates than drivers who did not submit a DOC. They further confirmed that the Learner stage time credit offered for taking an approved course was an important factor contributing to these higher rates. Study 2 was not, however, able to investigate whether an increase in the minimum Learner stage might reduce or reverse these findings.

In October 2003, as part of the GLP enhancement package, the minimum Learner stage for all GLP drivers was increased by 6 months. Drivers who submitted a DOC after October 2003 had to remain in the supervised Learner stage for at least 9 months; drivers who did not submit a DOC had to remain in the Learner stage for at least 12 months. Although the implementation of GLPe occurred too recently to permit a comprehensive impact assessment at this time, Study 2 was undertaken as a formative evaluation designed primarily to find out whether the GLPe Learner stage extension might have helped to reduce the effect of offering drivers who completed an approved driver education course the opportunity to leave the Learner stage three months early.

In the study described in this chapter, the early impacts of GLPe were evaluated in two ways. Firstly, to determine the early effects of GLPe on New driver crash rates (and on Learner driver crash rates) two New driver samples were selected. In order to control for seasonal variations in crashes, New drivers who entered GLPe between Oct 6, 2003 and December 31, 2004 were selected and their crash rates were compared to New drivers who entered the fully implemented GLP between October 6, 2001 and December 31, 2002. Crash rates were computed using a maximum follow-up period of 1.5 years for both groups (to March 31, 2005 for the GLPe group and to March 31, 2003 for the GLP group). Although future evaluations of GLPe will focus on calendar year intake periods (following the methods used in studies 1 and 2), a longer intake period (15-month) was used here in order to maximize the number of drivers who would have had time to progress through the 12-month Learner stage and into the Novice stage of GLPe.

Secondly, in order to assess the effects of GLPe on the Novice driver crash rates of those who elected to complete an ICBC-approved driver education course, two Novice driver samples were selected. For this part of the study it was necessary to limit the samples to those who had obtained a Novice licence and who had accumulated some Novice driver-time. As mentioned in the previous chapter, when comparing Novice driver crash rates it is important to base the rates on equivalent follow-up periods. Otherwise, any differences observed between their crash rates may simply be attributable to differences in risk (Novice drivers are at greatest risk when they first enter the Novice stage and then the risk declines) rather than to program effects. Due to the length of the GLPe Learner stage, the recency of GLPe implementation, and the lag time required

for a reliable crash count, the assessment of the impact of the ICBC-approved driver education course on the crash involvements of drivers exposed to GLPe had to be limited to the first 90-days of Novice licensure.

Due to the limited number of drivers who had progressed to the Novice stage when this was undertaken, the results concerning GLPe must be considered very early and not representative of the impact that the program is likely to have over a longer time frame. The 1-5-year study period upon which the New driver assessment was based was long enough only to get a preliminary view of the impact of the Learner stage; the results do not reflect what will happen to the New driver rate as more Learners advance to the Novice stage. For this impact to be assessed, a 3 or 4-year follow-up period will be required. As noted above, the primary reason for doing this study at this time was to find out what, if any, effect the time incentive for driver education was having on Novice crash rates within the context of GLP's longer Learner stage. Ongoing consultations concerning the role of the approved driver education course and, in particular, the retention of the time incentive, necessitated as early an assessment of the effect as possible. In this context, Study 3 has been conducted as a formative rather than summative evaluation, and no attempt has been made to evaluate the overall impact of GLPe on Novice driver crash rates. The amount of follow-up available for the drivers selected into the study was enough for an early, albeit preliminary, assessment of the DOC effect. However, 90 days want long enough to conduct an early assessment of the impact of the new GLPe Novice restrictions and conditions on Novice crash rates. The prohibition-free requirement, in particular, will take time to have a detectable effect.

6.1 Method

6.1.1 Sample Design

This study uses a quasi-experimental design in which drivers were followed prospectively from their licence issue date (Learner date for the New driver samples, Novice date for the Novice driver samples) to a specified study end date (see below). As the primary purpose of the study was to investigate the early impact of the Learner stage time discount on the crash rates of Novice drivers exposed to a longer minimum Learner period, the driver samples were categorized according to their licensing process (GLP or GLPe) and whether or not they submitted a DOC. Crash rates were computed for the New driver groups, Novice driver groups, and DOC – No DOC groups.

6.1.2 Sample

For the purposes of this study the following sample selection criteria were used:

GLPe New Drivers

All BC drivers who obtained their first Learner licence between October 6, 2003 and December 31, 2004.

From this group the following drivers were excluded:

- Any driver identified as having held an out-of-province licence at any point after their entry into GLPe;
- Drivers who did not meet the minimum time requirements for completion of the GLPe Learner and / or Novice stages;

GLPe Novice Drivers

All BC drivers who obtained their first Learner licence between October 6, 2003 and December 31, 2004 and who, by June 30, 2005, had accumulated a minimum of 90 days of active Novice licensure.

From this group the following drivers were excluded:

- Any driver who was identified as having held an out-of-province licence at any point after their entry into GLPe;

- Drivers who did not meet the minimum time requirements for completion of the GLPe Learner and / or Novice stages;

GLP New Drivers

All BC drivers who obtained their first Learner licence between October 6, 2001 and December 31, 2002.

From this group the following drivers were excluded:

- Any driver identified as having held an out-of-province licence at any point after their entry into GLP;
- Drivers who did not meet the minimum time requirements for completion of the GLP Learner and / or Novice stages;

GLP Novice Drivers

All BC drivers who obtained their first Learner licence between October 6, 2001 and December 31, 2002 and who, by June 30, 2003, had accumulated a minimum of 90 days of active Novice licensure.

From this group the following drivers were excluded:

- Any driver who was identified as having held an out-of-province licence at any point after their entry into GLPe;
- Drivers who did not meet the minimum time requirements for completion of the GLPe Learner and / or Novice stages;

6.1.3 Outcome Variables

The following were the primary outcome variables used in the study:

- New driver crash involvement rate – computed using total driver-time contributed and crashes that occurred between the date that the driver's first Learner's licence was issued until March 31, 2005 (for GLPe drivers) or March 31, 2003 (for GLP drivers). Drivers who died, surrendered their licence, or had a cancelled or expired licence before the study end date had their end date reset to the date of death, surrender or cancellation. As well, GLP drivers who transitioned into GLPe before reaching any other endpoint had their end date reset to their GLPe entry date. Learner and Novice crash involvement rates – computed by disaggregating the New driver crash involvement driver-time and crash counts into Learner and Novice driver-time and crash counts.

- 90-day Novice crash involvement rates – computed using the number of Novice driver crash involvements that occurred during the first 90-days of active Novice licensure

Crash rates were calculated using all crashes, liable crashes only, casualty crashes only, and material damage only crashes. In all cases, rates were calculated using **per licensed-driver years** in the denominator. Although the validity term of Learner licences was extended from one to two years with the implementation of GLPe, the rates were not adjusted to take into account this change. Due to the short follow-up period used in the calculation of the New driver crash rates any effect of the change in the validity term would be negligible (see section 4.1.4 for further discussion as to when and why such an adjustment would be needed).

6.1.4 Statistical Analysis

Crash involvement rates and relative risks were computed using Poisson regression techniques (see Section 4.1.4 for detailed description). All of the analyses were conducted using SAS Version 8 (1999) statistical software.

6.1.5 Data Sources

See section 4.1.5 for description of data sources.

6.2 Results

6.2.1 Sample Characteristics

Tables 51 and 52 show the age and gender distributions of new and Novice drivers in each of the GLP and GLPe study groups. For both of the New driver groups the age at entry into the licensing process is very similar: just over 60% of the drivers in each group obtained their Learner's licence while they were 16 years of age; 72% obtained it before turning 18 years of age. In contrast, when the samples were limited to those who had accumulated 90 days of Novice licensure, almost 80% of the GLPe drivers had obtained their Learner licence at age 16 compared to only 73% of the GLP drivers.

Table 51: Age on Issue Date of First Learner's Licence by Study Group

Age at First Learners (in years)	All New Drivers				Novice Drivers with 90-days Novice Licensure			
	GLP		GLPe		GLP		GLPe	
	N	%	N	%	N	%	N	%
16	41,044	61.4	39,844	62.3	18,575	72.8	9,517	79.6
17	7,454	11.1	6,431	10.1	2,523	9.9	815	6.8
18	4,134	6.2	3,893	6.1	1,210	4.7	425	3.5
19-21	5,327	8.0	5,225	8.2	1,333	5.2	487	4.1
22-24	2,154	3.2	2,314	3.6	446	1.8	200	1.7
>= 25	6,777	10.1	6,198	9.7	1,440	5.6	512	4.3
Total	66,890	100.0	63,905	100.0	25,527	100.0	11,956	100.0

Both of the New driver samples were almost evenly split between males and females (Table 52). However, the Novice driver samples had higher percentages of males suggesting that males tend to move through the Learner stage more quickly than females.

Table 52: Gender by Study Group

Gender	All New Drivers				Novice Drivers with 90-days Novice Licensure			
	GLP		GLPe		GLP		GLPe	
	N	%	N	%	N	%	N	%
Male	32,639	48.8	31,744	49.7	13,459	52.7	6,689	55.9
Female	34,247	51.2	32,161	50.3	12,068	47.3	5,267	44.1
Not Recorded	4	0.0	0	0.0	0	0.0	0	0.0
Total	66,890	100.0	63,905	100.0	25,527	100.0	11,956	100.0

Table 53 shows the age at which drivers in the GLP and GLPe groups obtained their first Novice licence. Of the 66, 890 drivers included in the GLP New driver group, 33,640 (50.3%) had obtained their Novice licence by the end of the 1.5-year study period (March 2003). In contrast, only 11,854 (18.5%) of the drivers in the GLPe had advanced to the Novice stage by the end of their 1.5-year study period (March 2005). This difference is a consequence of the longer Learner stage implemented with GLPe and is similarly reflected in the differences observed in the distribution of the ages at which drivers in the two groups obtained their Novice licence: almost 60% of the GLP New drivers who obtained their Novice licence within the study period were 16 years of age at the time the licence was issued compared to only 33% of the GLPe New drivers. A similar difference is seen between the percentage of 16 year olds in the GLP and GLPe Novice driver samples.

Table 53: Age on Issue Date of First Novice Licence by Study Group

Age at First Novice Licence (in years)	All New Drivers				Novice Drivers with 90-days Novice Licensure			
	GLP		GLPe		GLP		GLPe	
	N	%	N	%	N	%	N	%
16	19,874	59.1	3,952	33.3	15,319	60.0	3,948	33.0
17	6,460	19.2	5,538	46.7	4,662	18.3	5,611	46.9
18	2,255	6.7	800	6.8	1,762	6.9	809	6.8
19-21	2,301	6.8	756	6.4	1,754	6.9	769	6.4
22-24	689	2.1	258	2.2	519	2.0	256	2.1
>= 25	2,067	6.1	550	4.6	1,511	5.9	5,563	4.7
Total	33,646	100.0	11,854	100.0	25,527	100.0	11,956	100.0

Table 54 shows the number and percentage of Novice drivers in each study group who completed an ICBC-approved driver education course and submitted a DOC to an ICBC-driver services centre. Drivers who submitted a DOC could apply for up to a 3-month reduction of their Learner stage. A higher percentage of the drivers in the GLPe than in the GLP group submitted a DOC during the time periods studied. This suggests that the GLPe extension of the Learner stage from 6 to 12 months may have prompted more drivers to take an approved course in order to take advantage of the time discount.

Table 54: Number (%) of Novice Drivers in each Study Group who completed an ICBC-approved Driver Education course and submitted a Declaration of Completion (DOC) to a Driver Services Centre

DOC Submitted	All New Drivers				Novice Drivers with 90-days Novice Licensure			
	GLP		GLPe		GLP		GLPe	
	N	%	N	%	N	%	N	%
Yes	13,262	39.4	5,663	47.8	10,812	42.4	5,648	47.2
No	20,383	60.6	6,191	52.2	14,715	57.6	6,308	52.8
Total	33,645	100.0	11,854	100.0	25,527	100.0	11,956	100.0

Table 55 shows the total amount of licensed driver-time contributed by the drivers in the GLP and GLPe New driver samples. Recall that the intake periods used to obtain these samples were dynamic and took place over a 15-month period, while the follow-up period lasted for a maximum of 1.5 years (18 months). Drivers who entered the study in the 1st month would have contributed up to 18 months of driver-time while those who entered the study in the 15th month could have contributed no more than 3 months. During that time, only about half of the GLP drivers and a fifth of the GLPe drivers had graduated to the Novice stage. Thus, the statistics provided in Table 55 are preliminary and do not accurately reflect the actual length of the Learner stage (or Novice stage). They only reflect the status of the groups at the time they were assessed. It will not be possible to determine the actual length of the Learner stage (or Novice stage) until all of the drivers in each cohort have progressed to the Novice stage (or to Full Privilege licensure).

Table 55: Amount of Licensed driver-time Contributed by All GLP and GLPe New drivers and by New Drivers from each group who Advanced to the Novice Stage during the 1.5-year Study Period

Licensed Driver-Time	All New Drivers		New Drivers who Advanced to Novice Stage During Study Period	
	GLP (N=66,890)	GLPe (N=63,905)	GLP (N=33,646)	GLPe (N=11,854)
All Licensed-months (years)	679,435 (55,844)	637,974 (52,436)	405,944 (33,365)	175,153 (14,396)
Minimum Driver-months	0.2[1]	0.2[1]	3.1	9.1
Maximum Driver-months	18.1	18.1	18.1	18.1
Median driver-months	10.1	9.6	12.4	14.9
Mean driver-months	10.2	10.0	12.1	14.8
Learner-months (years)	489,574 (40,239)	597,099 (49,076)	216,083 (17,760)	134,278 (11,036)
Percentage of Total Months	72%	94%	53%	77%
Median Learner-months	6.7	9.1	6.2	12.0
Mean Learner-months	7.3	9.3	6.4	11.3
Novice-months (years)	189,861 (15,605)	40,875 (3,360)	189,861 (15,605)	40,875 (3,360)
Percentage of Total Months	28%	6%	47%	23%
Median Novice-months	0.2	0	5.3	3.3
Mean Novice-months	2.8	0.6	5.6	3.5

[1] *Reported time is less than the required minimum for Learner drivers in GLP (3 months) or GLPe (9 months) because of licences that were cancelled or surrendered shortly after the issue date.*

Table 56 shows the amount of licensed driver time contributed by the drivers in the GLP and GLPe Novice driver samples. Although the Learner times reported for these drivers are complete (since by definition all of the drivers in these samples had to have advanced to the Novice stage) they reflect the Learner times associated with the Novice drivers who moved most quickly through the licensing process. Due to the selection criteria used in defining the Novice driver samples, drivers who did not progress through the Learner stage quickly enough to accumulate 90 days of Novice licensure within the study time frame were excluded.

Table 56: Licensed Driver-time, Learner-time and Novice-time of GLP and GLPe New Drivers with 90-days of Novice Licensure

Licensed Driver-time (in months)	GLP (N=25,527)	GLPe (N=11,956)
All Licensed-months (years)	233,797 (19,483)	171,624 (14,302)
Minimum Driver-months	5.9	11.9
Maximum Driver-months	18.1	20.8
Median driver-months	9.1	15.0
Mean driver-months	9.2	14.4
Learner-months (years)	157,216 (13,101)	135,756 (11,313)
Percentage of total months	67%	79%
Median Learner-months	6.1	12.0
Mean Learner-months	6.2	11.4
Novice-months (years)	76,581 (6,382)	35,868 (2,989)
Percentage of total months	33%	21%
Median Novice-months	3.0	3.0
Mean Novice-months	3.0	3.0

6.2.2 Crash Characteristics

Liability and Severity. Table 57 summarizes the liability and severity of the Learner and Novice driver crash involvements by the licensing program to which the drivers were exposed (GLP or GLPe), and by the study group into which the drivers were selected. Only one notable difference was observed: in the 1.5-year study group the percentage of Novice crash involvements that resulted in a casualty was lower for the GLPe than the GLP group. No such difference was observed between the 90-day Novice groups. This suggests that the finding for the 1.5-year groups may have been related to the different amounts of Novice driver-time contributed by the GLP and GLPe Novice drivers. This will be investigated further in the evaluation of the GLPe impact on Novice crash involvement rates.

Table 57: Type of Crash Involvement (Liability and Severity) by Licence Stage, Program and Study Group

Type of Crash Involvement*	Study Group 1: 1.5-Year Study Period				Study Group 2: 90-Days Novice Licensure			
	Learner		Novice		Learner		Novice	
	GLP N (%)	GLPe N (%)	GLP N (%)	GLPe N (%)	GLP N (%)	GLPe N (%)	GLP N (%)	GLPe N (%)
Liable	**873 (69)**	**740 (69)**	**3,922 (69)**	**905 (69)**	**284 (61)**	**180 (65)**	**1,807 (72)**	**854 (72)**
Non-liable or liability not assigned	392 (31)	339 (31)	1,776 (31)	409 (31)	184 (39)	99 (35)	708 (28)	331 (28)
Total	1,265 (100)	1,079 (100)	5,698 (100)	1,314 (100)	468 (100)	279 (100)	2,515 (100)	1,185 (100)
Casualty	**334 (26)**	**263 (24)**	**1,603 (39)**	**360 (27)**	**127 (27)**	**58 (21)**	**692 (28)**	**319 (27)**
Material Damage	931 (74)	816 (76)	4,095 (61)	954 (73)	341 (73)	221 (79)	1,823 (72)	866 (73)
Total	1,265 (100)	1,079 (100)	5,698 (100)	1,314 (100)	468 (100)	279 (100)	2,515 (100)	1,185 (100)

Compliance with GLPe Rules and Restrictions among the Crash Involved. In order for GLPe to have an impact on crash involvement rates New drivers must adhere to the conditions and restrictions put in place during the Learner and Novice licensing stages. Due to the preliminary nature of this evaluation, no attempt was made to assess driver compliance with the rules of GLPe. However, information extracted from police reported collision data (TAS) was used to explore to what extent the characteristics of the reported crashes involving New drivers had characteristics that suggested contravention of GLPe rules and restrictions. The results are summarized in Table 58.

As shown in Table 58, a higher percentage of the Learner than Novice crashes involving drivers in the 1.5 year follow-up cohort had characteristics indicating a violation of GLP or GLPe rules or restrictions. The reporting of alcohol as a possible contributing factor also occurred more frequently in crashes involving the Learner drivers in the 90-day cohorts, as did violations of the Learner stage passenger restriction. The limited time frame that was available for the selection of the 90-day GLPe group, accompanied by the longer GLPe Learner stage, may have contributed to these findings. In order to be selected into the 90-day group, GLPe drivers would have had to proceed through the Learner stage fairly quickly. Non-compliant Learners in GLPe may have taken longer to complete the Learner stage (due to prohibitions delaying their progress) and therefore not been able to accumulate enough Novice time for inclusion in the study group. Crash involvement might also have delayed progress through the Learner stage and subsequently excluded drivers from the group. While these factors would also have affected the 90-day GLP group, they would have had less impact due to the shorter minimum Learner term in GLP. Additional time and data will be required before inferences about compliance among the crash involved GLPe Learner and Novice drivers can be drawn. The higher percentages of restriction violations observed in the 1.5-year group more accurately reflect the magnitude of non-compliance among the crash-involved.

Table 58: Number (%) of Driver Crash Involvements in which a Learner or Novice Restriction May have been Violated by Licence Stage, Program and Study Group

Crash Characteristics	Study Group 1: 1.5-Year Study Period				Study Group 2: 90-Days Novice Licensure			
	Learner		Novice		Learner		Novice	
	GLP	GLPe	GLP	GLPe	GLP	GLPe	GLP	GLPe
Driver had been Drinking	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Yes	**31 (8.2)**	**39 (12.3)**	**49 (2.8)**	**15 (3.7)**	**6 (5.4)**	**2 (2.9)**	**11 (1.4)**	**14 (3.8)**
No	349 (91.8)	278 (87.7)	1,684 (97.2)	393 (96.3)	106 (94.6)	68 (97.1)	760 (98.6)	353 (96.2)
Total	380 (100)	317 (100)	1,733 (100)	408 (100)	112 (100)	70 (100)	771 (100)	367 (100)
Time of Collision			Not Restricted	Not Restricted			Not Restricted	Not Restricted
Midnight – 5:00 am	**36 (9.5)**	**37 (11.7)**	**145 (8.4)**	**43 (10.5)**	**6 (5.4)**	**0 (0.0)**	**65 (8.4)**	**41 (11.2)**
5:00 am - 5:00 pm	191 (50.3)	159 (50.2)	837 (48.3)	207 (50.7)	58 (51.8)	40 (57.1)	352 (45.7)	176 (47.9)
5:00 pm - midnight	137 (36.0)	113 (35.6)	715 (41.2)	154 (37.7)	41 (36.6)	28 (40.0)	336 (43.6)	146 (39.8)
Unknown	16 (4.2)	8 (2.5)	36 (2.1)	4 (0.1)	7 (6.2)	2 (2.9)	18 (2.3)	4 (1.1)
Total	380 (100)	317 (100)	1,733 (100)	408 (100)	112 (100)	70 (100)	771 (100)	367 (100)
Passengers in vehicle[1]			Not Restricted				Not Restricted	
Passenger restriction may have been violated	**246 (63.0)**	**198 (62.5)**	**295 (17.0)** (if GLPe rules applied)	**48 (11.8)**	**61 (54.4)**	**34 (48.6)**	**129 (16.7)** (if GLPe rules applied)	**40 (10.9)**
No apparent violation of Passenger restriction	123 (31.6)	98 (30.9)	1,366 (78.8)	348 (85.3)	44 (39.3)	30 (42.8)	606 (78.6)	315 (85.8)
Unknown	21 (5.4)	21 (6.6)	72 (4.2)	12 (2.9)	7 (6.3)	6 (8.6)	36 (4.7)	12 (3.3)
Total	380 (100)	317 (100)	1,733 (100)	408 (100)	112 (100)	70 (100)	771 (100)	367 (100)

[1] *Passenger restrictions were applied to GLP Learner drivers and GLPe Learner and Novice Drivers. Learner drivers (GLP and GLPe) were not permitted to carry more than 2 passengers, one of whom had to be a supervising adult; GLPe Novice drivers were not permitted to carry more than 1 passenger (except for immediate family members) unless accompanied by a supervising adult (25 years of age or more).*

6.2.3 Assessment of GLPe Impact on New Driver Crash Involvement Rates

The early effects of GLPe on the crash rates of New drivers were assessed in two ways. The impact of GLPe on New driver rates and Learner driver rates was evaluated using the 1-5-year New driver study cohorts. The impact of completing the approved driver education course on Novice driver crash rates was assessed using the 90-day Novice driver cohorts. No attempt was made to assess the impact of the GLPe Novice restrictions and conditions on Novice driver crash rates. At the time when this evaluation was undertaken the number of GLPe drivers who had progressed to the Novice stage was too small to permit reliable estimation of a GLPe Novice stage effect. A preliminary assessment of the impact of GLPe on Novice driver crash rates is not recommended undertaken until the majority of drivers in the GLPe cohort have spent at least two years in the Novice stage.

The results summarized in Table 59 show that GLPe has been highly effective in reducing the New driver crash involvement rate. The GLPe New driver rate for all crashes was 63% lower than the rate obtained for the comparison group of GLP drivers, and the effect varied little across crash types. GLPe Learner driver crash rates were also significantly lower than the Learner crash rates obtained for the GLP drivers, although the magnitude of the percentage difference was smaller (about 30%).

Although, intuitively, it may seem odd that a 63% reduction would be observed for all crashes when there was only a 30% reduction in the Learner rate and a 7% increase in the Novice rate, the overall effect takes into account not only what was happening within each licence stage, but for how long. The overall rate for GLPe New drivers reflects the fact that 94% of the total driver time was at the lower Learner rate while for GLP New

drivers the Learner rate (the magnitude of which was also higher than the GLPe Learner rate) applied for only 72% of the total driver-time. Thus, to arrive at the total, the separate effects must be weighted by both the number of drivers in each stage and the amount of licensed time they contribute to the total..

Table 59: Crude New Driver Crash Involvement Rates[1] (per 100 licensed driver-years), Relative Risks and 95% Confidence Intervals (CI) – Overall and by Licence Stage (Learner and Novice)

Driver Group	Crash Type	Crash Rate (95% CI)	Relative Risk (95% CI)	% Difference (from REF Group)
All New Drivers	**All Crashes**			
GLPe (N=63,905)	GLPe	4.56 (4.38, 4.74)	0.37 (0.35, 0.38)	**-63%***
GLP (N=66,890)	GLP	12.47 (12.18, 12.76)	1.00 (Ref)	
	Liable Crashes Only			
	GLPe	3.13 (2.99, 3.29)	0.37 (0.35, 0.39)	**-63%***
	GLP	8.59 (8.35, 8.83)	1.00 (Ref)	
	Casualty Crashes Only			
	GLPe	1.19 (1.10, 1.28)	0.34 (0.31, 0.38)	**-66%***
	GLP	3.47 (8.35, 8.83)	1.00 (Ref)	
	Material Damage Crashes Only			
	GLPe	3.38 (3.22, 3.54)	0.38 (0.36, 0.40)	**-62%***
	GLP	9.00 (8.75, 9.25)	1.00 (Ref)	
Learner Drivers	**All Learner Crashes**			
GLPe (N=63,905)	GLPe	2.20 (2.07, 2.33)	0.70 (0.64, 0.76)	**-30%***
GLP (N=66,890)	GLP	3.14 (2.97, 3.31)	1.00 (Ref)	
	Learner Liable Crashes			
	GLPe	1.51 (1.40, 1.62)	0.69 (0.63, 0.77)	**-31%***
	GLP	2.17 (2.03, 2.31)	1.00 (Ref)	
	Learner Casualty Crashes			
	GLPe	0.54 (0.48, 0.60)	0.65 (0.55, 0.76)	**-35%***
	GLP	0.83 (0.74, 0.92)	1.00 (Ref)	
	Learner Material Damage Only Crashes			
	GLPe	1.66 (1.55, 1.77)	0.72 (0.65, 0.79)	**-28%***
	GLP	2.31 (2.16, 2.46)	1.00 (Ref)	
Novice Drivers[2]	**All Novice Crashes**			
GLPe (N=11,854)	GLPe	39.11 (37.00, 41.22)	1.07 (1.01, 1.14)	**+7%*** **
GLP (N=33,645)	GLP	36.52 (35.57, 37.47)	1.00 (Ref)	
	Novice Liable Crashes			
	GLPe	26.94 (25.18, 28.70)	1.07 (1.00, 1.15)	**+7%**
	GLP	25.13 (24.34, 25.92)	1.00 (Ref)	
	Novice Casualty Crashes			
	GLPe	10.72 (9.61, 11.83)	1.04 (0.93, 1.17)	**+4%**
	GLP	10.27 (9.77, 10.77)	1.00 (Ref)	
	Novice Material Damage Only Crashes			
	GLPe	28.40 (26.60, 30.20)	1.08 (1.0, 11.16)	**+8%*** **
	GLP	26.24 (25.44, 27.04)	1.00 (Ref)	

*P < 0.0001 **P < 0.005 ***P<0.05 [1] *Based on an average of about 10 months of licensed driving per driver(to a maximum of 1.5 years)*

[2] *Drivers in the New driver study groups who advanced to the Novice stage during the 1.5-year study period*

Effect of Age and Gender. The results presented in Table 59 were not adjusted for age and gender differences between the study groups. Due to the very similar distributions of gender and age at first Learner licence (Tables 51 and 52) within the New driver groups, these variables were not expected to have any major confounding effects in the comparison of the GLPe and GLP New driver and Learner driver crash involvement rates. Table 60 shows the adjusted estimates and, as expected, they vary little from the results in Table 59.

Table 60: New Driver Crash Rate Ratios and 95% Confidence Intervals (CI) – Overall and by Licence Stage (Learner and Novice) - after Adjustment for Age and Gender.

Driver Group	Crashes Type	Relative Risk (95% CI)	% Difference (from REF Group)
All New Drivers	**All Crashes**		
GLPe (N=63,905) GLP (N=66,890)	GLPe GLP	0.36 (0.35, 0.38) 1.00 (Ref)	**-64%***
	Liable Crashes		
	GLPe GLP	0.36 (0.34, 0.38) 1.00 (Ref)	**-64%***
	Casualty Crashes		
	GLPe GLP	0.34 (0.31, 0.37) 1.00 (Ref)	**-66%***
	Material Damage Only Crashes		
	GLPe GLP	0.37 (0.35, 0.39) 1.00 (Ref)	**-63%***
Learner Drivers	**All Learner Crashes**		
GLPe (N=63,905) GLP (N=66,890)	GLPe GLP	0.70 (0.65, 0.76) 1.00 (Ref)	**-30%***
	Learner Liable Crashes		
	GLPe GLP	0.70 (0.64, 0.77) 1.00 (Ref)	**-30%***
	Learner Casualty Crashes		
	GLPe GLP	0.65 (0.55, 0.76) 1.00 (Ref)	**-35%***
	Learner Material Damage Only Crashes		
	GLPe GLP	0.72 (0.66,0.80) 1.00 (Ref)	**-28%***
Novice Drivers[2]	**All Novice Crashes**		
GLPe (N=11,854) GLP (N=33,646)	GLPe GLP	1.06 (1.00, 1.13) 1.00 (Ref)	**+6%**
	Novice Liable Crashes		
	GLPe GLP	1.06 (0.98, 1.14) 1.00 (Ref)	**+6%**
	Novice Casualty Crashes		
	GLPe GLP	1.03 (0.92, 1.16 1.00 (Ref)	**+3%**
	Novice Material Damage Only Crashes		
	GLPe GLP	1.07 (1.00, 1.15) 1.00 (Ref)	**+7%**

*P < 0.0001 **P < 0.005 ***P<0.05 [1] *Based on an average of about 10 months of licensed driving per driver (maximum of 1.5 years)*
[2] *Drivers in the New driver study groups who advanced to the Novice stage during the 1.5-year study period*

Although the results summarized in Table 59 and 60 show an increase in crash rate for the Novice drivers included in the 1.5-year follow-up group, this finding is confounded by the different crash risks associated with the different amounts of Novice driver-time contributed by the GLP and GLPe groups; drivers with more experience in the Novice stage tend to have lower crash rates and, because of its longer Learner stage, GLPe drivers in the 1.5-year group accumulated a much lower percentage of Novice time than the GLP drivers (Table 55). Consequently, these findings should not be interpreted as an indication that the GLPe Novice restrictions have not had a positive effect. As mention above, until sufficient Novice data are available it is not possible to estimate the impact of GLPe on Novice driver crash rates. The data in Tables 59 and 60 were included solely to provide an indication of the relative contributions of the Learner and Novice crash rates within the 1.5-year New driver group.

In the next section the analyses undertaken to investigate the early impact of the extended GLPe Learner stage on the previously reported (chapter 4 of this report, Wiggins, 2004) association between completion of an approved driver education course, early Novice licensure, and the crash involvement rates of GLP Novice drivers are described. Due to the limited amount of follow-up data available when the study was undertaken, these results are relevant only to the first 90-days of Novice licensure and do not provide information regarding any longer-term effects.

The Effect of DOC Submission on Novice Crash Involvement Rates. Tables 61 through 64 show the results of the analyses undertaken to investigate the impact of submitting a DOC on the annualized crash involvement rates estimated from the first 90-days of Novice licensure. DOC drivers in both study groups (GLPe and GLP) were found to be at higher risk of crash involvement than No DOC drivers (Table 61). This relationship persisted after adjustment for the possible confounding effects of age and gender differences between the groups (Table 62). However, there was less of a difference observed between the DOC and No DOC drivers in the GLPe than in the GLP study group.

Two factors may have contributed to the findings shown in Tables 61 and 62. Firstly, the sample selection criteria used in creating the 90-day Novice groups may have resulted in a higher-risk GLPe No DOC group than would have occurred if more of the No DOC group had been available for inclusion in the study. Due to the dynamic nature of the licensing process and the need to conduct this evaluation as soon as possible, only those drivers who progressed through the Learner stage quickly were eligible for inclusion in the samples. Thus, the difference between the DOC and No DOC groups, in terms of the amount of Learner time contributed, was less than it would have been had a longer time frame been used for the study. In addition, under GLPe rules, drivers who completed an approved course had to have accumulated 60 hours of driving practice before receiving their DOC; under GLP rules only 30 hours were required. This increase in the required practice hours for DOC drivers in combination with the extension of the GLPe Learner stage to 9 months, may have prompted a reduction in their Novice crash rates. In an effort to examine the impact of the changes affecting the DOC but not the No DOC drivers, and to determine to what extent the Novice crash rates observed for the GLP and GLPe DOC groups differed in comparison to each other, the No DOC drivers were removed from the analysis and the crash rates of the GLPe and GLP DOC drivers were compared. Table 63 shows the results of these analyses and indicates that, after adjustment for potential age and gender differences between the groups, GLPe DOC drivers had lower crash involvement rates than their GLP DOC counterparts. However, a lack of statistical power resulting from the small sample sizes available for this study made it possible to detect only the reduction observed for liable crashes as statistically significant.

Table 61: Novice Crash Involvement Rates[1], Relative Risk Ratios, and 95% Confidence Intervals (CI) Estimated from the First 90 Days of Novice Licensure by Program and DOC Status

Novice Crashes by Program and DOC Status	Crash Rate (95% CI)	Relative Risk (95% CI)	% Difference (from REF Group)
All Crashes			
GLPe:			
DOC (N=5,648)	43.56 (40.12, 47.00)	1.21 (1.08, 1.35)	+21%**
No DOC (N=6,308)	36.14 (33.17, 39.11)	1.00 (REF)	
GLP:			
DOC (N=10,812)	46.98 (44.40, 49.57)	1.39 (1.28, 1.50)	+39%*
No DOC (N=14,715)	33.84 (31.96, 35.72)	1.00 (REF)	
Liable Crashes			
GLPe:			
DOC (N=5,648)	30.24 (27.37, 33.11)	1.12 (0.98, 1.28)	+12%
No DOC (N=6,308)	27.08 (24.51, 29.65)	1.00 (REF)	
GLP:			
DOC (N=10,812)	35.04 (32.81, 37.27)	1.50 (1.37, 1.64)	+50%*
No DOC (N=14,715)	23.38 (21.82, 24.94)	1.00 (REF)	
Casualty Crashes			
GLPe:			
DOC (N=5,648)	11.97 (10.17, 13.77)	1.26 (1.01, 1.57)	+26%***
No DOC (N=6,308)	9.52 (7.99, 11.03)	1.00 (REF)	
GLP:			
DOC (N=10,812)	13.21 (11.84, 14.58)	1.45 (1.25, 1.68)	+45%*
No DOC (N=14,715)	9.11 (8.13, 10.09)	1.00 (REF)	
Material Damage Crashes			
GLPe:			
DOC (N=5,648)	31.59 (28.66, 34.52)	1.19 (1.04, 1.36)	+19%***
No DOC (N=6,308)	26.63 (24.08, 29.18)	1.00 (REF)	
GLP:			
DOC (N=10,812)	33.78 (31.59, 35.97)	1.37 (1.25, 1.50)	+37%*
No DOC (N=14,715)	24.74 (23.13, 26.35)	1.00 (REF)	

*P < 0.0001 **P < 0.005 ***P<0.05

[1] *Rates were calculated per 100 licensed driver-years.*

Table 62: Relative Risk Ratios and 95% Confidence Intervals (CI) for Novice Driver Crash Involvements Rates – Estimated from the first 90 Days of Novice licensure and After Adjustment for Gender and Age at Novice Licensure

Novice Crashes by Program and DOC Status	Relative Risk (95% CI)	% Difference (from REF Group)
All Crashes		
GLPe:		
DOC (N=5,648)	1.24 (1.06, 1.44)	+24%**
No DOC (N=6,308)	1.00 (REF)	
GLP:		
DOC (N=10,812)	1.40 (1.29, 1.51)	+40%*
No DOC (N=14,715)	1.00 (REF)	
Liable Crashes		
GLPe:		
DOC (N=5,648)	1.20 (1.06, 1.43)	+20%***
No DOC (N=6,308)	1.00 (REF)	
GLP:		
DOC (N=10,812)	1.50 (1.36, 1.64)	+50%*
No DOC (N=14,715)	1.00 (REF)	
Casualty Crashes		
GLPe:		
DOC (N=5,648)	1.37 (1.02, 1.81)	+37%***
No DOC (N=6,308)	1.00 (REF)	
GLP:		
DOC (N=10,812)	1.44 (1.23, 1.67)	+44%*
No DOC (N=14,715)	1.00 (REF)	
Material Damage Crashes		
GLPe:		
DOC (N=5,648)	1.19 (1.00, 1.42)	+19%***
No DOC (N=6,308)	1.00 (REF)	
GLP:		
DOC (N=10,812)	1.38 (1.26, 1.52)	+38%*
No DOC (N=14,715)	1.00 (REF)	

*P < 0.0001 **P < 0.005 ***P<0.05

Table 63: Relative Risk Ratios and 95% Confidence Intervals (CI) for the Novice Crash Involvement Rates of GLP and GLPe drivers who Submitted a DOC – Estimated from the first 90 Days of Novice Licensure and After Adjustment for Gender and Age at Novice Licensure

DOC Drivers Only	Relative Risk (95% CI)	% Difference (from REF Group)
All Crashes		
GLPe (N=5,648)	0.92 (0.83, 1.01)	-8%
GLP: (N=10,812)	1.00 (REF)	
Liable Crashes		
GLPe (N=5,648)	0.85 (0.76, 0.95)	-15%***
GLP: (N=10,812)	1.00 (REF)	
Casualty Crashes		
GLPe (N=5,648)	0.90 (0.75, 1.08)	-10%
GLP: (N=10,812)	1.00 (REF)	
Material Damage Crashes		
GLPe (N=5,648)	0.92 (0.82, 1.04)	-8%
GLP: (N=10,812)	1.00 (REF)	

*P < 0.0001 **P < 0.005 ***P<0.05

To further estimate the potential impact of the time incentive offered to DOC drivers, the Novice crash rates of the GLPe drivers who did and did not submit a DOC were reanalyzed with the length of the Learner stage included in the regression model as a control variable. Table 64 summarizes the results of these analyses and shows that after taking into account the length of the Learner stage, the differences in the Novice crash involvement rates of the GLPe DOC and No DOC groups have not only disappeared but reversed direction. The estimated relative risks indicate lower adjusted crash rates for the DOC than the No DOC group. Once again, due to the small sample sizes, the findings were not statistically significant. However, they were consistent across all of the crash categories.

Due to the preliminary nature of these findings, the limited time frame used for estimating Novice crashes, and the small number of drivers available for the rate calculations, the results presented must be interpreted cautiously. However, taken in combination with the results presented in Chapter 4, they provide consistent evidence that removal of the time incentive remains warranted.

Table 64: Relative Risk Ratios and 95% Confidence Intervals (CI) for the Novice Crash Involvement Rates of GLPe drivers by their DOC status – Estimated from the first 90 Days of Novice Licensure and After Adjustment for Gender, Age at Novice Licensure, and the Length of their Learner Stage

GLPe Drivers Only	Relative Risk (95% CI)	% Difference (from REF Group)
All Crashes		
DOC (N=5,648)	0.96 (0.75, 1.21)	-4%
No DOC (N=6,308)	1.00 (REF)	
Liable Crashes		
DOC (N=5,648)	0.98 (0.74, 1.28)	-2%
No DOC (N=6,308)	1.00 (REF)	
Casualty Crashes		
DOC (N=5,648)	0.91 (0.57, 1.44)	-9%
No DOC (N=6,308)	1.00 (REF)	
Material Damage Crashes		
DOC (N=5,648)	0.97 (0.73, 1.27)	-3%
No DOC (N=6,308)	1.00 (REF)	

*P < 0.0001 **P < 0.005 ***P<0.05

7. Discussion and Recommendations

By increasing the length of the Learner stage, and achieving reductions in the crash rates of Learner drivers, BC's GLP (and, more recently, GLPe) has reduced crash rates for New drivers during their first two years of licensure. Despite this success the crash involvement rates of Novice drivers continue to be a concern. Neither BC's GLP (as implemented to the end of 2002) nor the ICBC-approved driver education curriculum has produced the safety benefits that were originally anticipated. Two issues remain outstanding: 1) what more can be done to bring down the high crash rates of Novice drivers, and 2) how to resolve the dilemma of driver education, both in terms of expectations and understanding.

These are not new issues. Both were identified as concerns in the year 3 interim evaluation and, in response, ICBC took steps to enhance the program's effectiveness – particularly in the Novice stage. Several program changes were introduced (in October 2003). In fact, with the implementation of the 2003 enhancements, ICBC's GLP (GLPe) now contains or exceeds many of the conditions and requirements recommended as a 'best practice' by Mayhew, Simpson, & Singhal, (2005). These include:

- Application of program to all new drivers not just young new drivers
- A three-stage licensing process
- Minimum age of 16 years for starting the process
- Adult supervision throughout the Learner stage and a maximum holding period of 24 months before having to be retested
- Minimum 12-month Learner stage (BC's minimum is 12 months although this can be reduced by up to 3 months by completing an approved driver education course)
- Night time restriction on driving during the Learner stage
- Lower penalty points thresholds during both the Learner and Novice stages
- Limits on passengers in the Novice stage
- An exit test to ensure competence prior to Full Privilege licensure
- Penalty provisions that delay graduation for new drivers with poor driving records
- Zero tolerance for drinking and driving

With the implementation of GLPe in BC, a passenger restriction and prohibition-free driving requirement were introduced into the Novice stage. It is too early to determine whether these changes to the Novice stage will reduce the crash rates of Novice drivers. It will take time for the effect to be detected. The results of the preliminary study of GLPe New drivers so suggest, however, that whether there have been reductions or not, Novice crash involvement rates do continue to be much higher than the rates obtained for comparison groups of Experienced drivers. The study also showed the strong influence on Novice crash rates of providing early licensure to drivers who completed an approved driver education course. Clearly, continued work is needed to develop additional strategies to help New and Novice drivers to acquire the skills and judgement they need to drive safely.

Although it was too soon, in this evaluation, to conduct a formal impact assessment of GLPe on New driver (including Novice driver) crash rates, a formative assessment was required due to the potential consequences (higher crash rates) associated with continuing to offer the time discount for driver education. When GLPe was implemented it was thought that a time incentive reducing a 12-month Learner stage by up to three months might not have the same impact on crash rates as it had on a 6-month Learner stage. The results described in this report do not support this assumption. Drivers who submitted a DOC and applied for early Novice licensure continued to have higher crash rates than those who did not. And, although the results are

preliminary and are based on only the first 90 days of Novice licensure they are consistent with previous findings from this and other jurisdictions. Therefore, based on these findings, as well as those reported for GLP and from other jurisdictions, it is recommended that the time incentive for completing an ICBC-approved driver education course be eliminated from GLPe.

It should, however, be stated that the findings of this study and the recommendation made for the removal of the time incentive are in no way meant to imply that the ICBC-curriculum does not or could not have value. More research is needed to evaluate the course and to determine what is and what is not working effectively, to investigate the potential of staged learning or other educational models, and to determine more specifically what the goals and objectives of driver education should be. Perhaps, given the multiplicity of factors that influence new drivers' behaviours, choices, skills, and abilities it is unreasonable to expect driver education to produce 'safer drivers'. Perhaps other standards need to be developed for determining what is and isn't 'effective' driver education, at least in the short term.

Research conducted over the past 10 years suggests that teaching people to drive safely may require more emphasis on 'insight' training, staged learning (through both the Learner and Novice stages), comprehensive training in hazard perception, as well as training in self-assessment and awareness (Gregersen, 1995; Lonero, et. al. 2001;Engstrom, et. al., 2003; Senserrick & Whelan, 2003). Standard road tests may not be the best mechanisms for assessing who has or has not acquired the appropriate skills, experience, and judgement to drive safely. Other assessment tools, or combinations of tools (including road tests, computer-assisted learning and assessment, or simulation technologies) may be needed. As well, finding more ways to involve parents in the process may prove fruitful. Emerging research suggests that parental involvement and role modelling may be very important in helping to promote safer driving behaviours and attitudes of amongst their children (Ferguson, et. al., 2001; Bianchi & Summala, 2004; Hartos, et. al., 2005; Wilson, et. al., 2005).

Clearly, the ultimate goal of driver education is to produce better, 'safer', drivers and more research is needed to address these and other issues related to driver training and assessment. But, until such research is available, perhaps a focus on other, more intermediate objectives might be helpful. In this regard, one of the findings of Study 2 was that drivers who passed their first road test had early (first-year) Novice crash rates that were about 30% less than those of drivers who took three or more attempts. Interestingly, 75% of GLP drivers who submitted a DOC and took a Class 7 road test passed the test on their first attempt; compared to only 62% of the drivers who did not submit a DOC. This suggests that the approved course may be preparing drivers for their first road test more effectively than the preparation drivers receive who do not take the course. Of course, it could and often is argued that driver education achieves this objective by teaching new drivers how to pass the road test rather than teaching them to 'drive'. But, perhaps this is not the primary issue. The road test is, after all, the main criterion that most jurisdictions use to determine who is and is not ready for solo driving. Perhaps rather than being concerned that driver educators are 'teaching to the test', it would be best to focus on what the test is testing. If the road test is comprehensive enough and is of a high enough standard to be used to test driving readiness then perhaps 'teaching to the test' – at least at the end of the Learner stage – is not an unreasonable goal. However, it is not yet clear why drivers who pass the road test on the first attempt have a lower crash rate. More research will be needed to identify and better understand the factors that are contributing to this finding and to determine how driver education and the road test component of GLP can or may need to be adapted to optimize their potential benefits.

RECOMMENDATIONS

1. Continue to monitor and evaluate the effectiveness of GLPe in reducing the crash involvement rates of New drivers, with particular emphasis on the impact of the new Novice stage components.

   The findings of this evaluation concerning the impact of GLPe on New driver crash involvement rates are too early to be considered with anything but cautious optimism. The program enhancements do appear to be having significant and substantial positive impacts on New driver crash rates. However, very limited follow-up data were available for this evaluation, and it is unknown to what extent the benefits will continue over time or to what extent any benefits will be obtained from the changes to the Novice stage. The effectiveness of GLPe, in particular the Novice stage enhancements, will have to be monitored and evaluated once additional data becomes available. Of course, the new Novice stage components will have no chance of success if the rules are not followed. Consequently, a study to ascertain compliance with the new rules should be included in the evaluation plan.

2. Assess compliance with the GLPe Novice restrictions and continue to investigate new ways to effect crash rate reductions among drivers in the Novice stage of licensure.

   The present evaluation was undertaken before the impact of the 2003 enhancements on Novice driver crash rates could be estimated reliably. However, it was clear from the analysis of the first 90-days of Novice licensure that Novice drivers still have higher crash rates than experienced drivers. Until this disparity is eliminated efforts to find new ways to effect crash rate reductions in Novice driver rates should continue.

3. Review and evaluate the approved driver education curriculum and determine to what extent standards for implementation and delivery have been achieved. Investigate new driver education models, including the potential benefits of adding an advanced component during the Novice stage.

   The approved driver education curriculum has not been evaluated since the 2000 (Potentier and Zolinksy, 2000) preliminary review. Much work has been done to improve the standard of course implementation and delivery. However, without an evaluation it is unknown to what extent an appropriate standard has been achieved. It is also unknown what elements of the curriculum may be working effectively or ineffectively. Since the driver education curriculum was first developed and implemented a number of New driver education models and theories have been emerging in the research literature. The potential benefits of these strategies need to be investigated and, if appropriate, incorporated into the current curriculum model.

4. Remove the learner time incentive offered to new drivers who complete an approved driver education course. This would best be done in a way that mitigates any unintended consequences, such as the dissolution of the approved course, without having a confounding influence on crash rates.

   The evidence demonstrating the detrimental impact of offering a learner stage time incentive for driver education was consistent across all of the Novice driver groups assessed (Early GLP, Full GLP, and GLPe); Novice drivers who submitted a DOC in application for a Learner stage discount had higher crash rates than those who did not. The time incentive needs to be removed and strategies for enhancing and evaluating the effectiveness of the approved driver education course in the absence of this confounding factor need to be explored.

   However, removal of the time incentive could have unintended consequences; it could lead to the dissolution of the approved course and to the loss of an important, and unique, opportunity to test the effectiveness of the curriculum model. To avoid this possibility, alternative incentive mechanisms that would not be expected to have a confounding influence on crash rates, but that could help to ensure the continuation of the course while the work of recommendation #3 is undertaken, could be considered.

5. Review the role and content of the Class 5 exit test for New drivers.

   Although a before – after comparison revealed a significant reduction in the crash rate of drivers who passed the road test and graduated out of GLP, little other evidence was found to suggest that the test has predictive validity for crash involvement. Moreover, the high percentage of drivers who passed the test after taking the new Class 7 test suggests there is a high degree of overlap between the tests.

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