Motor scooters and mopeds – a growing attraction for young people

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ABSTRACT

In the last decade, the growth in motorcycling and the associated road trauma has largely been among riders aged 25 and over who already have car licences and are taking up riding for the first time or returning to riding, mainly for recreation. Yet the fatality rate (expressed in terms of distance travelled) for 17-25 year old motorcyclists is three times that of riders aged 26-39 years and is more than 30 times higher than for 17-25 year old car drivers (ATSB, 2002).

More recently, sales of scooters and mopeds have increased at a greater rate than for other types of on-road motorcycles and much of the marketing is aimed at the young. We know little about the crash involvement of scooters and mopeds and whether they are safer for young people (or riders of all ages) than other motorcycles. There are difficulties in defining motor scooters and mopeds and identifying them in crash and other data bases. This paper presents analyses that compare the nature and extent of young rider moped crashes with motorcycle crashes in Queensland in 2001 to 2005. While the number of motorcycle crashes involving young riders increased by 83% during this period, the number of moped crashes increased by 208%. Riders aged 17-24 were involved in 38% of moped crashes but only 25% of motorcycle crashes. The severity profiles of motorcycle and moped crashes were similar. The interpretation of these data and its implications for licensing and other countermeasures will be discussed.

INTRODUCTION

Australia, in common with other developed countries, is experiencing a boom in the sales and use of motorcycles. The number of motorcycles registered increased by 20% from 2001 to 2005 (ABS, 2006), the strongest growth of any vehicle type in Australia. From a public health perspective, the increase in motorcycling presents an enormous challenge because motorcycle riders and their pillion passengers are especially vulnerable in crashes. Across Australia, the number of motorcyclist (rider and pillion) fatalities has risen from 175 in 1997 to 238 in 2006 (Australian Transport Safety Bureau, 2007).

There have been two major changes that have contributed to the growth in motorcycling – more older riders and the growth in popularity of scooters.

The number of older motorcyclists killed or injured in crashes has increased in the last decade in many developed countries including the United States (National Center for Statistics and Analysis Research and Development, 2005; Stutts, Foss & Svoboda, 2004), Great Britain (Sexton, Broughton, Elliott & Maycock, 2004) and Australia (Australian Transport Safety Bureau, 2005). Yet the crash rate of older riders, even inexperienced ones, is lower than for younger riders, so improving the safety of younger riders remains a priority. Figure 1 shows that the fatality rate for motorcycle riders aged 17-25 in 1998-2000 was 47 deaths per 100 million vehicle kilometres travelled, which is three times the figure for riders aged 26-39 (14.5) and six times the figure for riders aged 40 and over (7.7) (ATSB, 2002). Of particular concern, is that

the fatality rate for young motorcyclists was about thirty times greater than for young drivers (1.3), the group for which much countermeasure development has been taking place.

While the increase in older riders began in the 1990s, in the last decade the biggest increase in sales of new powered two-wheelers is among scooters and mopeds. National sales figures for January to June 2006 (fcai.com.au) show that new scooter and moped sales increased by 64.4% from the same period the previous year (which had recorded a 30% growth from the previous year). New scooters and mopeds are now the largest segment of the on-road motorcycle market. Mopeds comprised five of the ten best-selling new on-road motorcycles in Australia in January to June 2006.

Scooters and mopeds are being aggressively marketed as low cost alternatives to the car for commuting. New mopeds are being sold for less than $2,000, with claims that fuel costs are lower than public transport. With increasing fuel prices, commuting to work on a scooter or moped may be becoming increasingly attractive. Furthermore with the increasing expense and space limitations of parking in metropolitan areas, commuters may be looking toward two wheeled transport as a means of reducing parking fees (Wigan, 2000). In recent decades, most motorcycling has been for recreation (e.g., Reeder, Chalmers & Langley, 1996; Haworth, Mulvihill & Symmons, 2002; Harrison & Christie, 2004; Haworth & Mulvihill, 2005), but this trend may be changing, particularly for scooters and mopeds.

There is little Australian research regarding the safety of scooters and mopeds. The lack of an official definition of a motor scooter means that crash and registration data for these vehicles are not easily available. Informally, vehicle design is commonly used to differentiate between a motorcycle and a scooter. A motorcycle has a step-over design where the rider must step over the vehicle to mount it. Most scooters have a step-through design and smaller wheels than motorcycles. Most scooters are small-capacity automatic low speed machines but there are also very large capacity touring scooters. In contrast, the Australian Design Rules state that a moped has two or three wheels, an engine cylinder capacity not exceeding 50 ml and a speed not exceeding 50 km/h. Despite this definition, mopeds are not reliably identified in crash data in most Australian jurisdictions.

Early investigations of moped safety in Australia included surveys of riders and preliminary crash data reported by Wigan and his colleagues in the late 1970s and an inquiry into the safety of mopeds by the Victorian Parliamentary Road Safety Committee in 1979 which focused on licensing issues. The Committee's 1993 Inquiry into Motorcycle Safety in Victoria also made recommendations about moped definitions and licensing.

Several more recent Australian surveys of motorcyclists have gathered information about type of motorcycle ridden and self-reported crash experience. Unfortunately, there were generally few scooters and mopeds in these samples, making the results less reliable than for (then) more popular types of motorcycles. In addition, relatively few of the respondents were young riders.

In Harrison and Christie's (2003) survey of riding exposure by NSW motorcyclists, only 3.9% of respondents were scooter riders. Scooter riders rode less distance per

year than other riders and rode more in urban areas, on lower speed roads. They rode relatively more on weekdays and were relatively older. The self-reported crash rate for scooter riders (crashes per 100,000 kms) was the lowest of all motorcyclists. A subsequent analysis of claims data from the NSW Motor Accidents Authority (Christie, 2003) showed that scooters comprised less than 5% of all motorcycle claims between 1989 and 1999 and that very few of these scooter riders were aged below 25 years. However, the percentage of scooter injuries that were MAIS 4 or above (severe injury, critical injury or maximum injury virtually unsurvivable) was higher than for any other type of motorcycle.

In the survey of NSW motorcyclists reported by de Rome, Stanford and Wood (2004), 3.4% of respondents rode a "light commuter/scooter". These riders were less likely to report having been involved in a crash, but their crashes were more likely to be multiple vehicle. The survey identified that scooter riders were less likely to wear protective clothing than other riders.

Most of the research into the safety of scooters and mopeds comes from Europe where these vehicles have traditionally been very popular. Studies from Sweden, Britain and Holland have reported higher crash risks for mopeds and scooters than other motorcycles, but differing results have been found in France and Greece. In 1998, the Swedish National Road and Transport Research Institute showed that, per kilometre travelled, there is a 20 times higher risk of being injured when travelling by moped (and 10 times higher risk when travelling by motorcycle) than by car (Aare, 2003). Sexton et al. (2004) concluded that British moped and scooter riders have the highest accident risk (adjusted for mileage) of any motorcycle riders and these vehicles tend to be ridden by those riders with least experience. Dutch data (SWOV, 2006) shows that the crash rates for bicycles and cars are 10 to 20 times lower than the rates of the motorized two-wheelers. The values for the motorcycle are an average of 55% lower than those for both light-mopeds and mopeds. The crash rate for riding a light-moped is higher than riding a moped. These data reflect that while the standard vehicle speed for the light-moped is 25 km/h and for the moped 45 km/h, wearing of a helmet is obligatory for the moped but not for the light-moped. This data is interesting in that it suggests that the high crash risk for the moped is not just a reflection of the high risk of young riders, in that the rate for the moped is greater than for the motorcycle for all ages from 18 to 39.

Other studies have found differing results. Yannis, Golias and Papadimitriou (2005) investigated the combined effects of driver age and engine size on motorcycle crashes in Greece. Once the influence of driver age on accident fault was taken into account, engine size had no effect. In France the risk of being injured in a moped accident is equivalent to motorcycles and up to 7-10 times higher than for car drivers. But the risk of being fatally injured by a moped accident is lower than in motorcycle accidents (1.8 - 2 times) (Filou, 1995; Filou et al., 1994 cited in Noordzij 2001).

The recent SUNflower+6 study found that the Netherlands has a greater percentage of moped riders among the road deaths than Sweden or the United Kingdom, with many of the road deaths among 15-19 year olds being moped riders in all three countries (Wegman et al., 2005, cited in SWOV, 2006). Dutch research shows that the crash rate for all 15-17 year old moped riders is more than 50 times higher than the average for all other age groups and transport modes. This is partly to do with the transport

mode: the crash rate for moped riders is nearly 40 times higher than the average for all age groups and other transport modes and partly to do with their age: the crash rates for 15-17 year olds are about 4 times greater than for the other age groups and all transport modes. SWOV concludes that "in the hands of young road users, the moped is a dangerous vehicle".

The possible causes for the high crash rate of mopeds were identified as: the combination of inexperience, overestimation of their own skills, and riding many kilometres among young (especially male) riders, insufficient knowledge of converting traffic rules into safe traffic behaviour, speed (especially for young riders) and not wearing a helmet.

The European studies of scooter and moped safety are of limited relevance to Australia, because until recently in many European countries, moped licences could be obtained by riders as young as 14 or 15 and helmet wearing was not mandatory in some countries for slow mopeds.

Given the increase in popularity of scooters and mopeds and the lack of current Australian information about their safety, an analysis of Queensland crash data was undertaken. Queensland has about one-third of all Australian scooter sales. Mopeds are allowed to be ridden with only a car licence, and comprised 83.6% of new scooter sales in the first half of 2005 (Black, 2005). While scooters cannot be easily identified in the crash or registration data, mopeds are identifiable in the registration data, which provided the opportunity to analyse a matched crash and registration data file.

METHOD

Queensland Transport supplied spreadsheets containing details of: (1) registration information for all vehicles that were coded as motorcycles in their crash data for 2001-05; (2) crash information for all motorcycles in crashes; (3) information about all crashes involving motorcycles; and (4) information about all casualties in crashes involving motorcycles. The crash and registration files were merged to allow the more specific vehicle information in the registration data (make, model and body type) to be used to distinguish the different types of powered two-wheelers in crashes.

The characteristics of the merged data set are summarised in Figure 2. The data set contained information on 7609 powered two wheelers (PTWs) reported to be involved in road crashes from 2001 to 2005. The registration number was recorded for 7224 of these vehicles, allowing matching with the registration data. Of the vehicles for which registration number was not recorded, 253 (3.3%) were coded as unregistered, 58 (0.7%) were coded as "unknown", 69 (0.9%) coded "98", and 5 were hit and run crashes.

Of the 7224 vehicles for which registration data was available, 1016 (14.1%) had no information on make, model, or body type. A further 552 were missing model information only. Where information on body type was available, 5965 (96.1%) were coded as motorcycles, 227 (3.7%) as mopeds, 8 (0.1%) as motor trikes, and 8 (0.1%) as sidecars. How many of the PTWs coded as motorcycles are traditional stepover

motorcycles and how many are scooters, or some other classification cannot be direct ascertained from the data.

Analysis of the make and model data revealed inconsistencies in the coding of body type. Among vehicles with the same recorded make and model, some were coded as motorcycles and others were coded as mopeds. In some instances, it is likely that the coding of body type was accurate and the apparent discrepancy resulted from the make and model information being sufficiently vague so as to include several variants of a PTW, some of which were truly mopeds and some of which were actually larger scooters (which are coded as motorcycles). In other cases, the coding of body type was inconsistent with the make and model information. This led us to reclassify body type, resulting in 306 vehicles being identified as mopeds for the analysis (see Figure 3).

RESULTS

There were 306 mopeds involved in 303 crashes. Crashes involving mopeds increased each year from 25 in 2001 to 97 in 2005. Across the entire time period, the majority of crashes were hospitalisations (43%) or medical treatment (38%). Four were fatal, 52 were minor injury crashes (17%) and only one crash resulted in property damage only.

Moped crashes of young riders

More than one-third (38%) of riders in moped crashes were aged 17-24 (see Table 2). No moped riders were aged under 17. Table 3 shows that only 27% of the crashes of young moped riders occurred in the Brisbane area, with 23% on the Gold Coast and 16% in the Townsville area (compared with 33%, 16% and 16% for older riders). Overall, 74% of crashes of young moped riders occurred in daytime (6am-6pm) and 74% occurred on weekdays. Speed limits were 60 km/h or less for 84% of these crashes. For young riders, 45% of crashes occurred at intersections and 37% were single vehicle crashes. Fall from vehicle was the most common event in single vehicle crashes and angle crashes made up 30% of all crashes. Only 9% were rear end crashes.

Among the young riders in moped crashes, 38% of riders were female. Full licences were held by 34% of riders, with 26% with provisional licences and 18% with learner licences. Only 62% of young moped riders held Queensland licences, with 21% having interstate licences and 14% having overseas licences (see Table 4). In contrast, only 5% of older riders had interstate licences and 4% had overseas licences.

Comparison of young people's moped and motorcycle crashes

The comparisons are based on those vehicles which we have classified as mopeds, compared with those we have classified as motorcycles. Vehicles that were unable to be classified (e.g. because of missing registration data) were omitted. Thus, the comparison includes 306 mopeds and 5886 motorcycles in crashes (rather than the total 7609 in the original crash data).

During 2001-2005, the ratio of motorcycle to moped crashes was about 19:1 for all age groups and 12:1 for riders aged under 25. Young riders were involved in 24% of motorcycle crashes and 38% of moped crashes. Table 2 shows that while the number of motorcycle crashes involving young riders increased by 83% during this period, the number of moped crashes with young riders increased by 208%. The severity profiles of motorcycle and moped crashes were similar (Table 1).

Moped crashes of young riders were less likely than motorcycle crashes to occur in the Brisbane area and more likely to occur on the Gold Coast and in the Townsville area (see Table 3). For this young group, similar proportions of moped and motorcycle crashes occurred in daytime and on weekdays. Somewhat more moped than motorcycle crashes occurred at low speed zones: 84% of moped crashes and 75% of motorcycle crashes. Similar proportions of crashes occurred at intersections and similar proportions were single vehicle crashes. The distributions of crash type were somewhat similar, with moped crashes being somewhat more likely to involve fall from a vehicle or hit parked vehicle and somewhat less likely to involve an angle collision or a rear end crash.

While no moped riders were aged under 17, there were 13 motorcycle riders in crashes who were aged under 17. Seven of these riders were recorded as holding Queensland learner permits and two were recorded (miscoded) as holding Queensland open licences (Table 4). Young moped riders were more likely to hold an interstate (21%) or overseas licence (14%) than motorcycle riders (1.1% and 0.7%, respectively).

DISCUSSION

Many more young riders are injured in motorcycle crashes than in moped crashes. The 83% increase in young riders injured in motorcycle crashes from 2001 to 2005 is of great concern, and the increase in young moped riders injured is more than 200%. The similar severity of motorcycle and moped crashes is another cause for concern. This belies the projected image of mopeds as small and slow and safe, no harder to ride than a bicycle. However, it should be noted that while the severity pattern is similar for motorcycles and mopeds, the data do not address the risks of crashing on the two types of vehicles. It may be that fewer moped crashes occur as a function of distance travelled, but we do not have the data to answer this question.

The other issue is that the severity measure in the Police crash data is very coarse and does not provide any indication of whether the nature of the injuries are similar. Given the survey data suggesting that scooter riders are less likely to wear protective gear, it may be that the scooter riders are suffering largely lacerations and motorcycle riders are having more fractures.

The data suggest that tourism is a strong contributor to moped crashes of young riders. The young rider moped crashes were mostly not in Brisbane and many riders were licensed interstate or overseas. In contrast, relatively few older moped riders were licensed interstate or overseas. Thus, the popularity of moped riding in Queensland appears to have two components, with tourism contributing more for younger riders and commuting contributing more for older riders.

The data point toward the role of inexperience in moped crashes of young riders, particularly the number of "fall from vehicle" crashes. The licensing variables do not indicate whether or not the rider held a motorcycle licence. It is speculated that many riders did not.

The findings of these analyses reflect the nature of moped use in Queensland, where the ability to ride a moped on a car licence means that many moped riders are not only young but also inexperienced riders of powered two wheelers (and a significant number are riding in unfamiliar conditions). In other jurisdictions where a motorcycle licence is required to ride a moped, there are likely to be many fewer moped riders and perhaps the population of riders may be better trained and more experienced. It would be useful to undertake a similar data analysis in another State, if the numbers of moped crashes were sufficient to allow meaningful calculations.

CONCLUSIONS

There is much that we still need to learn about the impacts of the growth in popularity of scooters and mopeds on road safety and the transport system. The analyses presented here show that while moped crashes comprised only a small fraction of on-road crashes of powered two-wheelers in 2001-05, they are increasing at a faster rate than motorcycle crashes. The similar severity of moped and motorcycle crashes suggests that moped crashes are a potential threat to young people and merit further investigation. Decisions about moped licensing need to be based on a better understanding of these issues.

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Table 1. Numbers of mopeds and motorcycles in crashes in Queensland 2001-2005 by crash severity.

	Crash severity						
	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Unknown	Total
Mopeds							
2001	0	13	7	5	0	2	27
2002	1	20	16	7	0	1	45
2003	0	25	26	15	0	0	66
2004	0	28	29	14	0	0	71
2005	3	44	38	11	1	0	97
Total	4	130	116	52	1	3	306
Motorcycles							
2001	10	339	323	137	17	16	842
2002	23	443	321	176	19	22	1004
2003	37	575	399	196	12	31	1250
2004	40	641	397	207	41	22	1348
2005	54	708	422	211	25	22	1442
Total	164	2706	1862	927	114	113	5886

Table 2. Numbers of moped and motorcycle riders in crashes in Queensland 2001-2005 by age group.

	Age group							
	0-16	**17-24**	25-29	30-39	40-49	50+	Unknown	Total
Mopeds								
2001	0	12	6	5	1	3	0	27
2002	0	14	5	12	6	6	2	45
2003	0	22	12	5	6	20	1	66
2004	0	30	7	13	12	9	0	71
2005	0	37	10	14	19	16	1	97
Total	0	115	40	49	44	54	4	306
Motorcycles								
2001	3	191	136	231	176	98	7	842
2002	1	231	150	277	204	122	19	1004
2003	1	295	199	354	248	145	8	1250
2004	6	331	208	364	271	159	9	1348
2005	2	349	192	389	325	175	10	1442
Total	13	1397	885	1615	1224	699	53	5886

Table 3. Characteristics of crashes of moped and motorcycle riders aged under 25.

Crash characteristic	Moped crashes %	Motorcycle crashes %
Location		
Brisbane area	27.0	41.9
Gold Coast	22.6	12.0
Sunshine Coast	3.5	7.5
Cairns area	7.8	3.5
Townsville area	15.7	6.9
Other areas	23.5	28.2
Daytime	74.1	72.9
Night-time	25.9	27.1
Weekday	74.1	71.9
Weekend	25.9	28.1
Speed zone		
40	2.7	1.9
50	24.1	13.8
60	57.1	59.5
70	2.7	7.1
80	9.8	8.6
90	0.0	0.8
100	3.6	8.2
110	0.0	0.0
Intersection	44.6	49.2
Not at intersection	55.4	50.8
Single vehicle	36.6	29.4
Multiple vehicle	63.4	70.6
Crash type		
Angle	29.5	37.2
Fall from vehicle	24.1	20.7
Head-on	2.7	2.1
Hit animal	0.0	1.7
Hit object	16.1	13.5
Hit parked vehicle	5.4	0.5
Hit pedestrian	0.9	0.9
Other	0.0	0.1
Overturned	0.0	0.0
Rear-end	8.9	13.7
Sideswipe	12.5	9.6

Table 4. Licence status of moped and motorcycle riders aged under 25 in crashes.

	Moped riders	Motorcycle riders
Licence status		
Cancelled disqualified	1.7	3.2
Expired		0.3
Inappropriate Class	3.5	2.9
Learner	18.3	16.0
Never held a licence	0.9	0.6
Not applicable	0.0	0.0
Not known	1.7	0.4
Not licensed Australia	12.2	0.7
Open	33.9	49.4
Provisional/restricted	26.1	25.7
Unlicensed	1.7	0.9
Licence state		
Queensland	61.7	96.8
Interstate	20.9	1.1
Overseas	13.9	0.7
Unknown	3.5	1.3

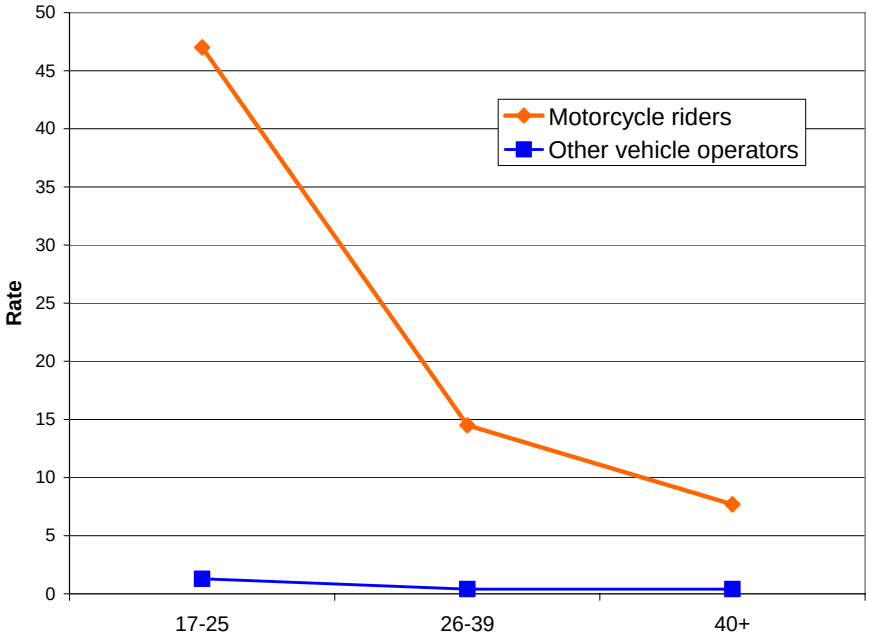

Figure 1. Fatality rates per 100 million vehicle kilometres travelled for motorcycle riders and other vehicle operators – Australia 1998-2000. From ATSB (2002).

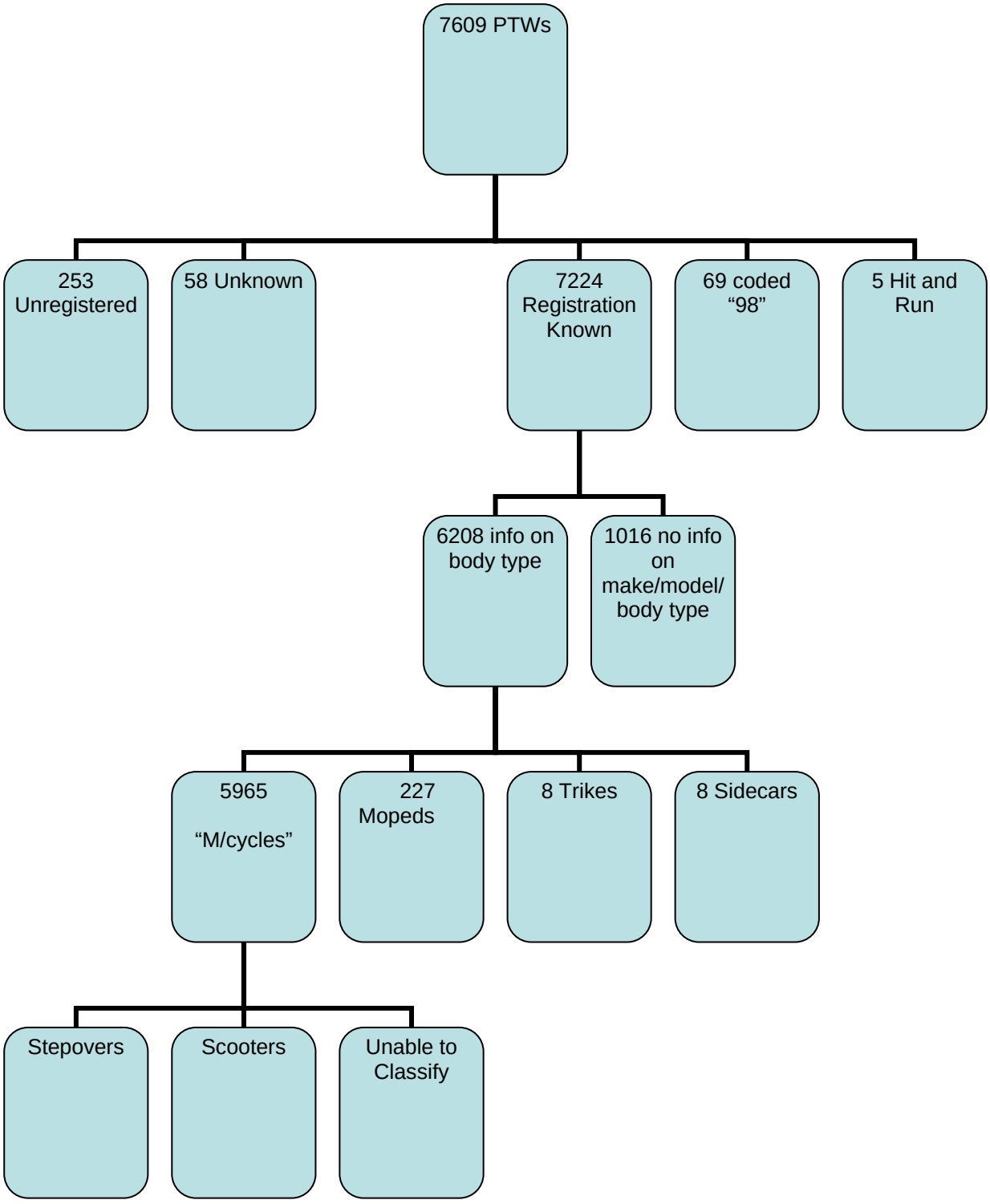

Figure 2. Initial Classification of Powered Two Wheelers (PTWs) from Queensland Crash Database.

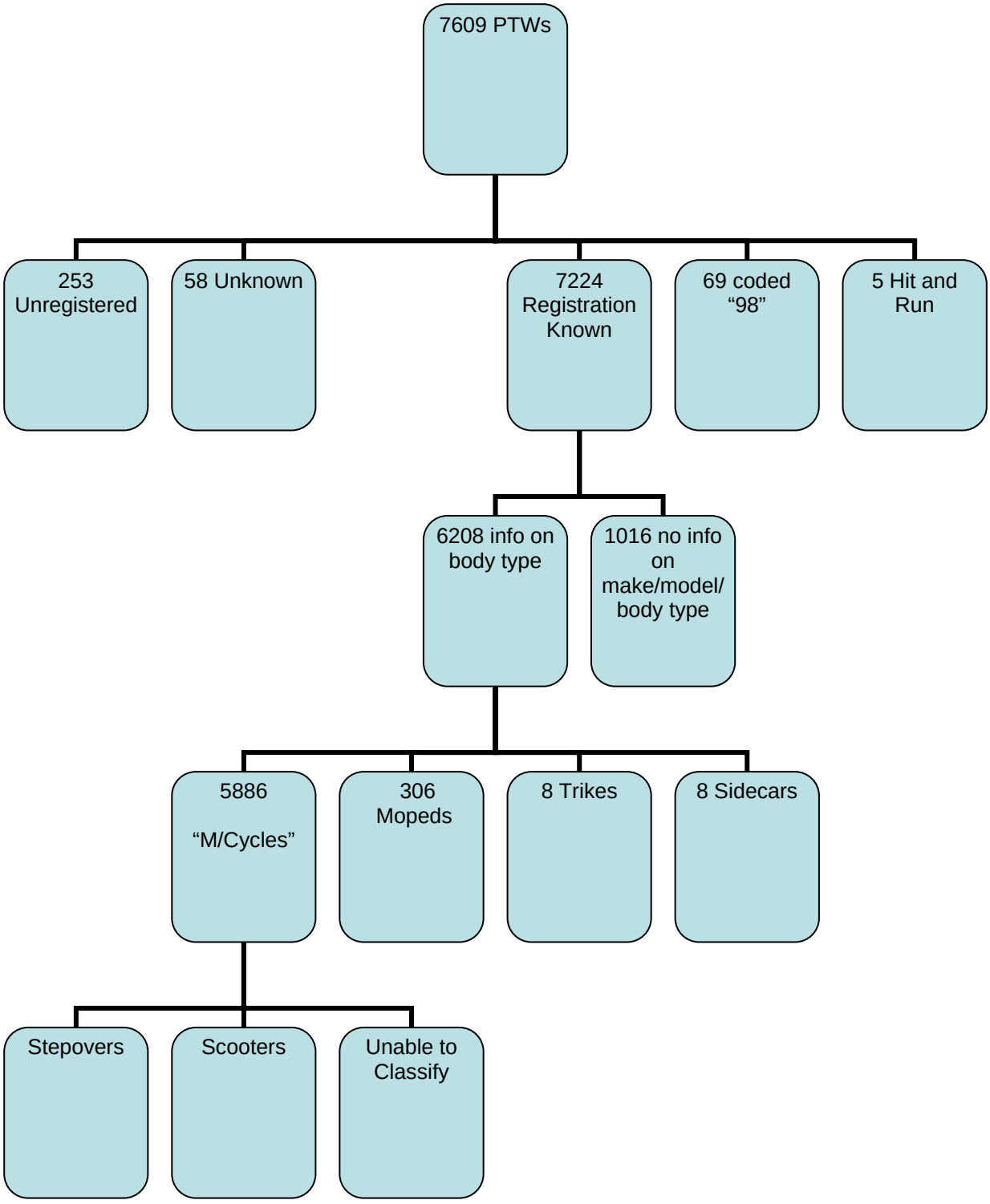

Figure 3. Reclassification of Powered Two Wheelers (PTWs).