ANALYSIS OF THE NEISS DATA

FOR BICYCLE-ASSOCIATED ACCIDENTS

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16. Abstract

This report describes the Highway Safety Research Institute's continuing research effort sponsored by the Bicycle Manufacturers Association. This work began in 1974 with the study and evaluation of the National Electronic Injury Surveillance System operated by the Consumer Product Safety Commission. That study looked closely at the operation of NEISS in general, and at the data produced by CPSC as they related to bicycle-associated accidents in particular.

This year's report extends the analysis of the NEISS data to include the calendar years 1975 and 1976. The HSRI standard summary, which was developed earlier in this program, is provided for bicycle-associated accidents for this time period. In addition, analyses of data from selected in-depth investigations are reported.

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1. INTRODUCTION AND SUMMARY

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This year's report extends the analysis of the NEISS data to include the calendar years 1975 and 1976. The HSRI standard summary, which was developed earlier in this program, is provided for bicycle-associated accidents for this time period. In addition, analyses of data from selected in-depth investigations are reported.

2. ANALYSIS OF NEISS DATA

The data gathered by the CPSC through the NEISS is still the most nearly nationally representative data available on product-associated injuries treated in hospital emergency rooms. Injuries reported through the NEISS which were associated with bicycles during calendar 1976 and 1977 are analyzed. The data are quite limited in detail, containing in particular no information about causation of the accident, or now a certain product was associated with an injury. Hence it is important to bear in mind that those data are mere associations, not necessarily indicative of cause and most often not due to a product defect or failure. The strengths and weaknesses of the NEISS have been discussed previously by Flora et. al. (1975).

The estimated national yearly totals of bicycle-associated injuries treated in hospital emergency rooms during the years 1972-1977 and the estimated sampling errors associated with these numbers are presented as the last two lines in in Table 2-1. With the exception of 1976, there is a gradual yearly increase in these reported injuries. The first year (1972) has an unusually low estimated number, which may be the result of start-up problems within NEISS itself. Since the sample is only of injuries treated in hospital emergency rooms and not elsewhere, the estimates could also be affected by changes in the source of treatment. For example, if more people begin going to a hospital emergency room rather than to a clinic or private physician for treatment, these estimates could increase even though the total number of bicycle-associated injuries remained constant or even decreased.

Table 2-1 also presents more detail on the trend in bicycle-associated injuries with time, giving the estimated number for each month from January 1972 to December 1977. There is a very large seasonal component. The monthly totals are plotted in Figure 2-1, and Table 2-2 gives

average totals for each month.

Table 2-1

Estimated National Total Bicycle-Associated Injuries

Injuries

Month	1972	1973	1974	1975	1976	1977
January .	3,580	7,158	15,700	12,827	9,197	8,255
February	3,940	7,371	14,353	10,209	15,780	16,634
March . .	10,510	18,909	24,356	21,404	25,748	29,221
April . .	28,899	32,611	43,180	34,536	41,834	51,786
May . . .	40,443	45,540	55,010	67,258	50,836	69,786
June . .	47,100	63,887	64,245	72,752	64,613	71,880
July . .	56,016	72,666	73,323	78,429	74,604	78,083
August .	63,496	69,797	69,210	74,569	71,706	74,290
September	46,697	51,897	48,732	51,249	49,663	48,266
October .	21,194	31,058	26,053	28,905	24,105	26,387
November	8,439	11,233	15,188	15,047	11,659	12,133
December	6,781	7,794	8,034	9,807	7,605	822
Total . .	337,095	419,921	457,384	476,810	447,350	487,473
Standard Deviation of Total	17,649	20,810	23,296	23,124	25,375	23,970

The smooth curve in Figure 2-1 represents a mathematical model for predicting the total number of accidents per month. The estimating model is:

$$Y = 36991 + 37.955X + 33923 \text{ Sin } ((x-4)/6)$$

where Y = estimated monthly total
X = number of month, beginning with one for January, 1973
and ending with sixty for December, 1977.

Note that the linear trend is extremely small relative to the seasonal effect. That is, on the average, there have been about 38 more bicycle-associated accidents each month after adjusting for season. This is not statistically different from zero (t=.74326, p=.4604). Thus, the apparent

increasing trend may be the result of chance variation and not indicative of an increase at all. This is consistent with the findings reported previously on the data through June 1975.[1]

For this model r^2=.92840. Hence the model fits the data quite well, explaining 92.8% of the month-to-month variation in the estimated number of bicycle-associated injuries. The small increase in accidents above the predicted values in Jaunuary of 1974 and 1975 may be associated with new bicycles being received for Christmas.

An alternative model which incorporates regular effects such as Christmas and school vacations, is estimated as:

$$Y = -2133.6 + 71.332X + .99466Mi,$$

where Y and X are defined as above, and Mi represents the monthly average of accidents. The fit of this model is somehat better; r^2 is .97736, so 97.7% of the variation is explained. Once again, the increasing trend is small relative to the constant term and the seasonal effects, but this time it is significantly different from zero (p=.0159). It is plotted in Figure 2-2.

The estimated distribution of these accidents by age and sex is given in Table 2-3 for 1976 and Table 2-4 for 1977. The distribution by age alone is given in Table 2-5 for 1976 and Table 2-6 for 1977. The distribution for 1976 is presented graphically in Figure 2-3 and that for 1977 is presented in Figure 2-4.

Approximately twice as many males as females were involved in these accidents. Children predominate with the age groups 5-9 and 10-14 each accounting for nearly one-third of the bicycle accidents. A slight shift toward more

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[1]Flora, J.D., Abbott, R., and Kaplan, R., Extension of the NEISS Data Analysis Including CPSC In-Depth Reports on Bicycle-Associated Accidents, UM-HSRI-77-23. March 1977.

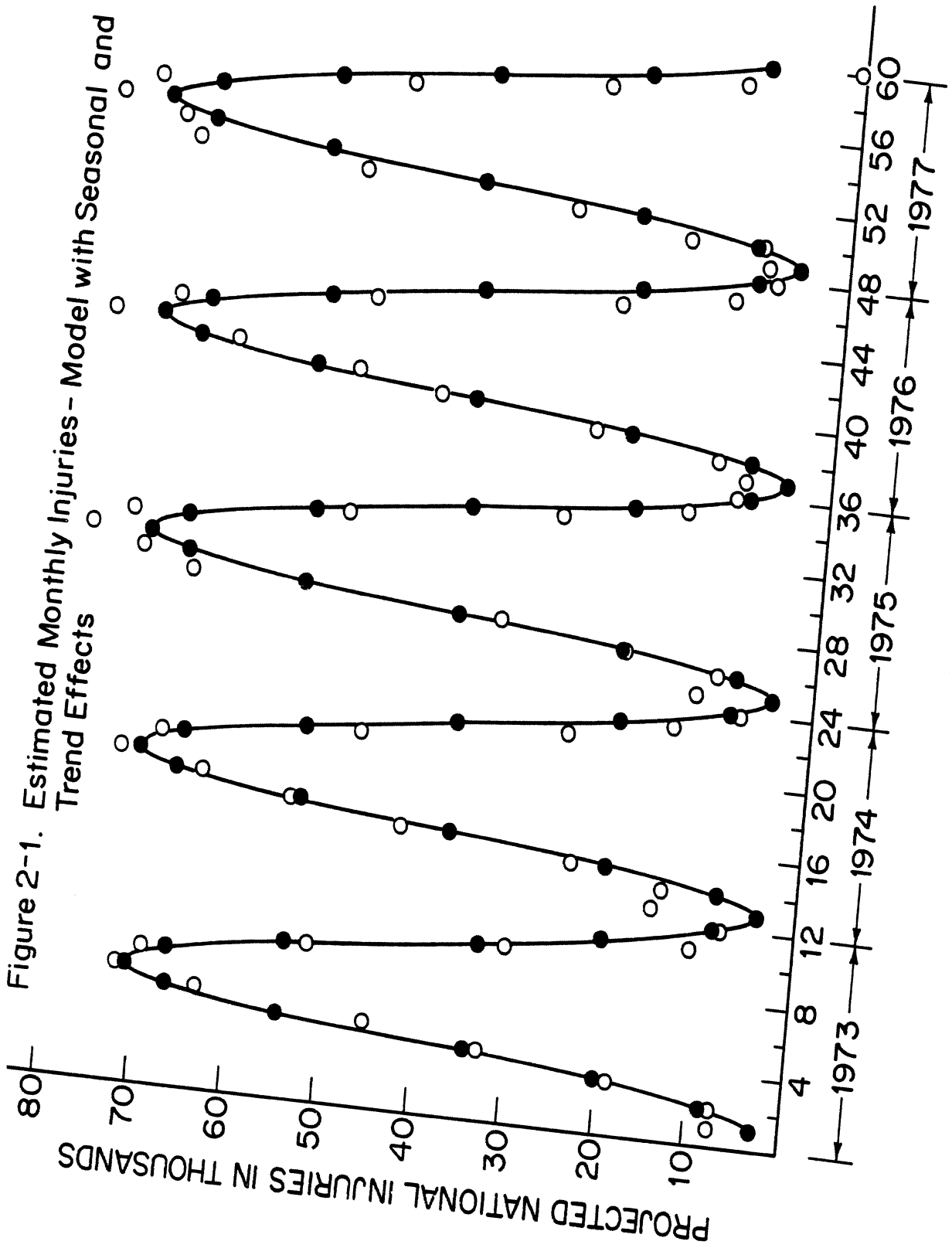


Figure 2-1. Estimated Monthly Injuries - Model with Seasonal and Trend Effects

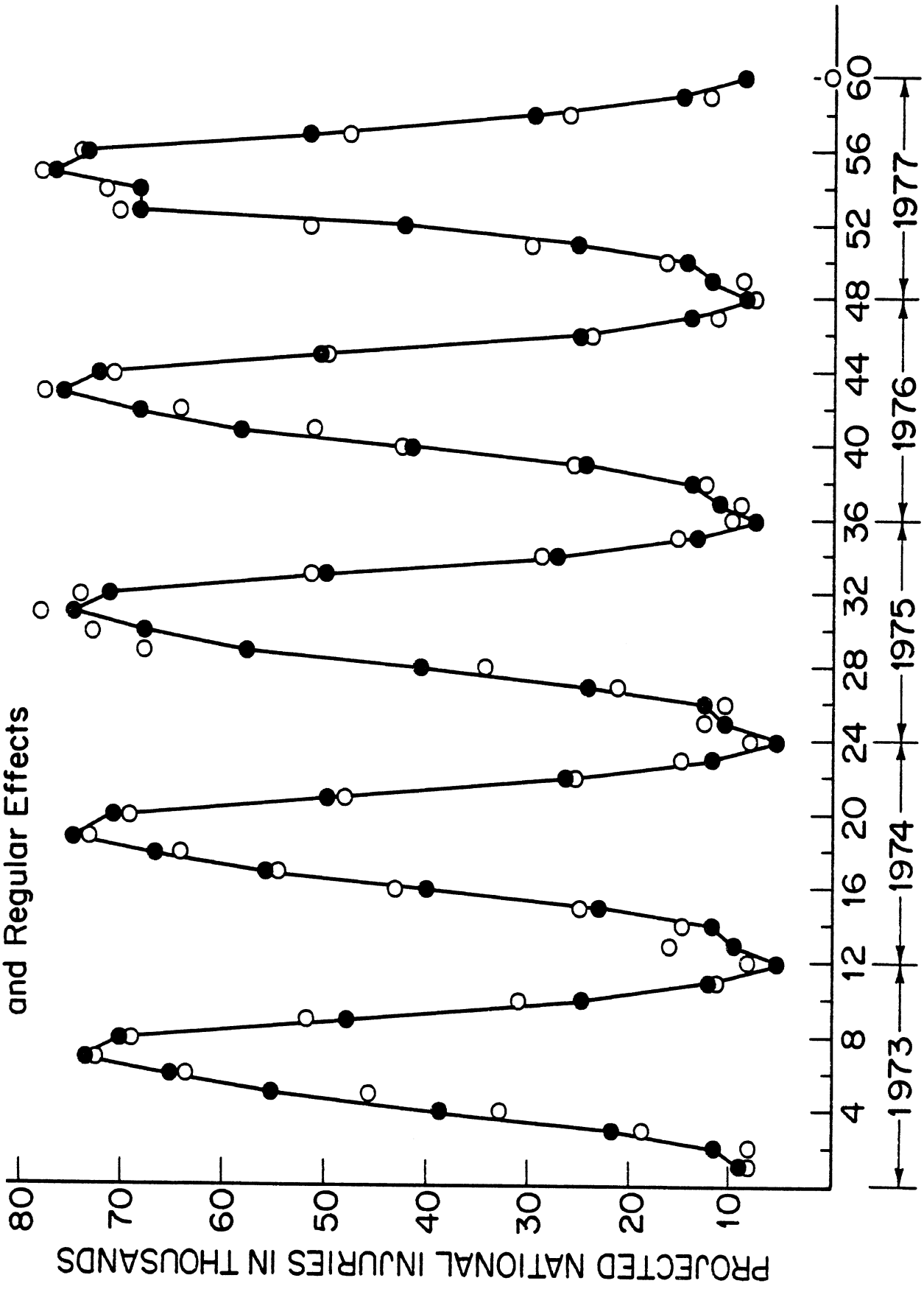


Figure 2-2. Estimated Monthly Injuries- Model with Seasonal, Trend and Regular Effects

Table 2-2

Average Number of Bicycle-Associated Injuries by Month

Month	Number Injuries
January .	10627.4
February	12869.4
March . .	23927.6
April . .	40775.4
May . . .	57686.0
June . .	67439.4
July . .	75421.0
August .	71914.4
September	49961.4
October .	27301.6
November	15052.0
December	6812.4

Table 2-3

Estimated Number of Bicycle Injuries by Age and Sex for the United States, 1976

Age	Males	Percent	Females	Percent
<2 . .	111.14	.0366	89.290	.06328
2-4 . .	24759.	8.15925	15506.	10.9893
5-9 . .	91955.	30.3035	53478.	37.9008
10-14 .	112800.	37.1729	40094.	28.4153
15-19 .	39787.	13.11169	12614.	8.9398
20-29 .	19023.	6.2689	10089.	7.1503
30-39 .	5711.8	1.88230	47821.	3.3892
40-49 .	3694.1	1.21738	2399.3	1.7004
50-59 .	1400.6	.4615	1898.5	1.3455
60-69 .	1154.7	.38052	722.69	.51218
70+ . .	3050.4	1.00525	1826.1	1.2941
TOTAL .	303446.74	———	141099.68	———
Percent	(68.2598)	——	(31.740)	——

use of bicycles by older persons has continued. In 1976,

Table 2-4

Estimated Number of Bicycle Injuries by Age and Sex
for the United States, 1977

Age	Males	Percent	Females	Percent
<2 . .	120.3	.04	16.6	.01
2-4 . .	22878.0	7.10	15955.0	9.67
5-9 . .	102220.0	31.73	62421.0	37.82
10-14 .	114250.0	35.46	44816.0	27.15
15-19 .	44139.0	13.70	15778.0	9.56
20-29 .	19204.0	5.96	10354.0	6.27
30-39 .	8578.4	2.66	7843.5	4.75
40-49 .	3815.9	1.18	3303.9	2.00
50-59 .	2729.2	.85	1891.2	1.15
60-69 .	1958.6	.61	558.3	.34
70+ . .	2257.7	.70	2130.3	1.29
Total .	322151.12	——	165067.79	——
Percent	66.12	——	33.88	——

76% of the accidents occurred to persons under 15, in 1977 this figure was 74%. Also, persons over 20 accounted for 12.5% of the accidents in 1976, and 13.3% in 1977. Even though these shifts are small, the usage shift may be greater than that indicated by these estimates because older people tend to have fewer accidents for the same exposure.

Table 2-7 defines the injury diagnoses and body part classification used by CPSC. The estimated distribution of injuries by sex and severity is given in Table 2-8 for 1976 and 2-9 for 1977. The distribution is also presented graphically in Figure 2-5 for 1976 and 2-6 for 1977. Tables 2-10 and 2-11 give the estimated distribution of injuries by severity for 1976 and 1977, respectively The corresponding graphical representations are Figures 2-7 and 2-8.

The distribution of injuries by severity category in 1976 and 1977 appears not to have changed from the distribution seen in previous years. The estimated severity values for 1976 and 1977 were 39.3 and 39.7 respectively.

Table 2-5

Estimates Number of Bicycle Injuries by Age
for the United States, 1976

Age	Number	Percent
<2 .	200.4	.04
2-4 .	40265.0	9.00
5-9 .	145540.0	32.53
10-14	153040.0	34.21
15-19	52546.0	11.75
20-29	29111.0	6.51
30-39	10494.0	2.35
40-49	6093.3	1.36
50-59	3299.2	.74
60-69	1877.4	.42
70+ .	4885.7	1.09
Total	447352.0	

Table 2-6

Estimated Number of Bicycle Injuries by Age
for the United States, 1977

Age	Number	Percent
<2 .	137.0	.03
2-4 .	38833.0	7.97
5-9 .	164680.0	33.78
10-14	159120.0	32.64
15-19	60070.0	12.32
20-29	29557.0	6.06
30-39	16429.0	3.37
40-49	7119.8	1.46
50-59	4620.4	.95
60-69	2516.8	.52
70+ .	4388.0	.90
Total	487471.0	

TABLE 2-7. NEISS Injury Matrix

SUMMARY OF SEVERITY INDEX

Category 7 - Category 6's who are hospitalized and deaths - Severity Value of 2516

Diagnosis	Severity Category 6 Severity Value - 360	Severity Catetory 6 Severity Value - 81	Severity Category 4 Severity Value - 31	Severity Category 3 Severity Value - 17	Severity Category 2 Severity Value - 12	Severity Category 1 Severity Value - 10
Amputation	Any part of body					
Avulsion	25% of body +	head, eye, upper trunk	lower trunk	leg, arm, hand, foot, finger, toe	mouth, ear	
Burns	25% of body + or eye	all single body parts except finger, toe, ear			ear, finger, toe	
Cell Damage	25% of body +	head, face, eye, upper or lower trunk		leg, arm, hand, foot, finger, toe		
Concussion	25% of body +	head				
Contusion or Abrasion	25% of body +			head, upper trunk	ear, mouth, neck, eye, lower trunk	arm, leg, hand, foot, finger, toe
Crushing	head, arm, leg, trunk, foot, hand		finger,toe			
Dislocation	25% of body +	head, upper trunk	lower trunk, eye		arm, leg, hand, foot, finger, toe	
Foreign Body	25% of body +	head, upper trunk	lower trunk	mouth	arm, leg, hand, foot, finger, toe, eye	
Fracture	25% of body +	head, neck, upper and lower trunk	eye	arm, leg, hand, foot, finger, toe, mouth		
Hematoma	25% of body +	head, upper trunk	eye, lower trunk	arm, leg, hand, foot	finger, toe, ear, mouth, neck	
Internal Organ Injury	25% of body +	head, neck, upper or lower trunk	mouth, eye			
Laceration	25% of body +		head, eye, upper or lower trunk		arm, leg, hand, foot finger, toe, ear	
Nerve Damage	25% of body +	all other body parts				
Puncture	25% of body +	head, face, upper trunk	eye or lower trunk		arm, leg, hand, foot finger, toe, mouth	
Strain or Sprain	25% of body +			neck, upper trunk	lower trunk, eye	arm, leg, hand, foot, finger, toe, ear
	anoxia, electric shock, submersion	ingested or aspirated foreign object				
Dermatitis			25% of body +		head, face, eye, upper and lower trunk	arm, leg, hand, foot, finger, toe, ear

Figure 2-3. Age and Sex Distribution of Bicycle Associated Injuries
1976

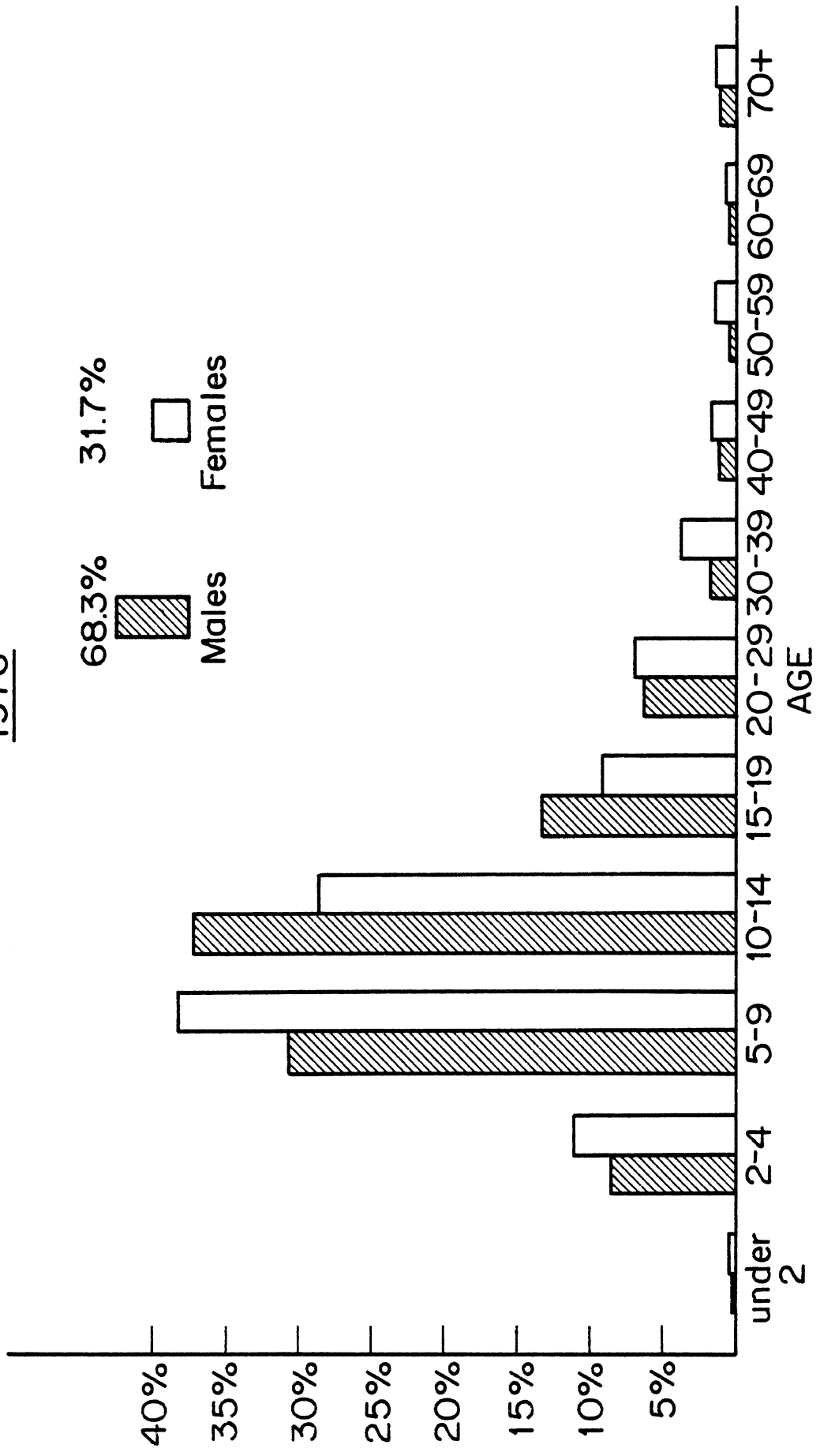


Figure 2-4. Age and Sex Distribution of Bicycle Associated Injuries
1977

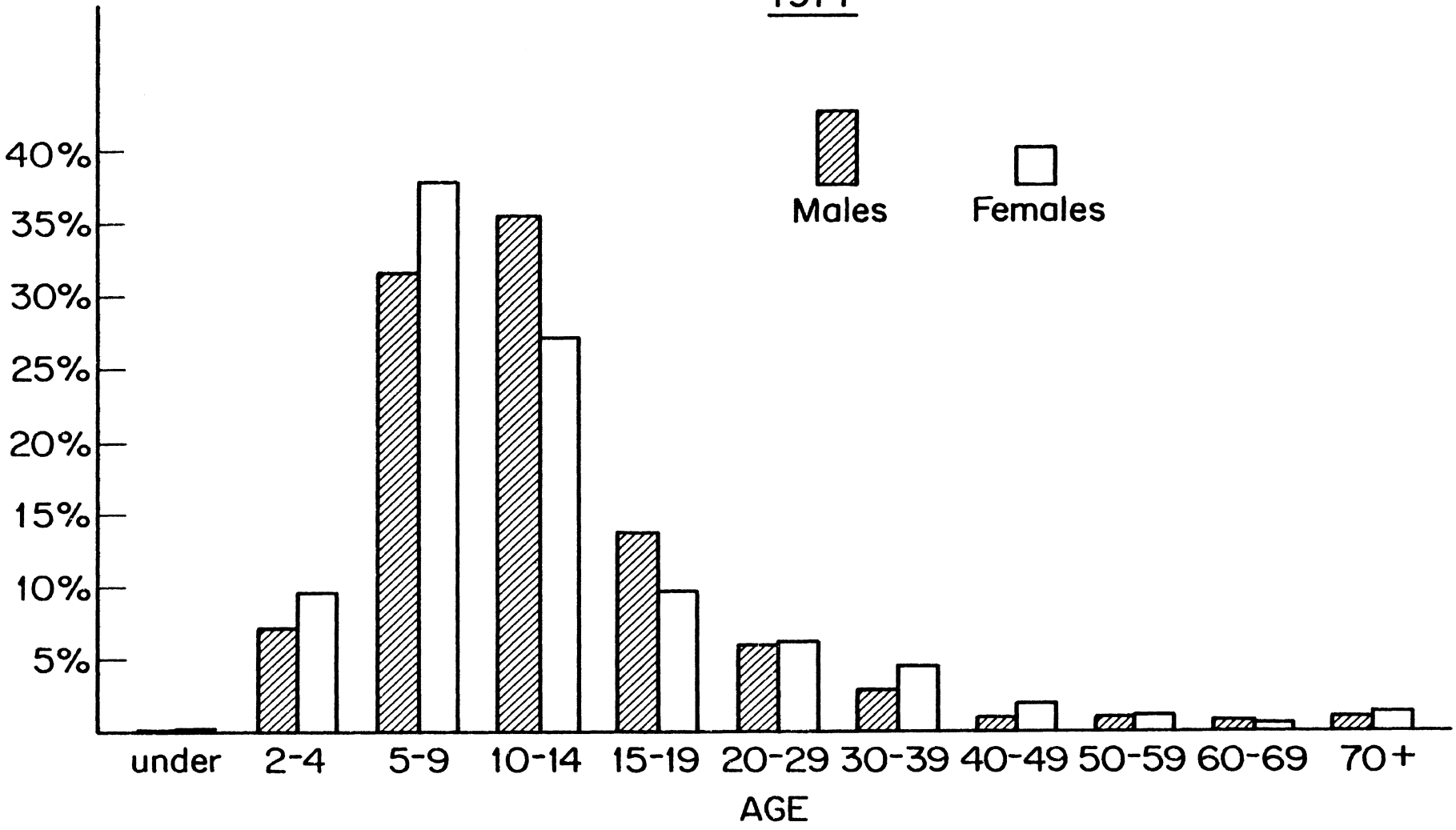


Table 2-8

Estimated Number of Bicycle Injuries by NEISS Severity Category and Sex, 1976

Category	Male	Percent	Female	Percent
1 . . .	76224.0	25.20	44487.0	31.07
2 . . .	52996.0	17.52	24668.0	17.23
3 . . .	67258.0	22.24	34511.0	24.10
4 . . .	71865.0	23.76	27629.0	19.30
5 . . .	21713.0	7.18	6502.0	4.54
6 . . .	11784.0	3.90	4976.3	3.48
7 . . .	355.7	.12	399.6	.28
8 . . .	282.5	.09	0.0	.00
Total .	302478.2	——	2143172.9	——
Percent	67.87	——	32.13	——

Table 2-9

Estimated Number of Bicycle Injuries by NEISS Severity Category and Sex, 1977

Category	Male	Percent	Female	Percent
1 . . .	83806.0	26.05	54472.0	33.02
2 . . .	56861.0	17.67	28466.0	17.25
3 . . .	78207.0	24.31	37340.0	22.63
4 . . .	66990.0	20.82	30366.0	18.41
5 . . .	23824.0	7.41	7741.1	4.69
6 . . .	11177.0	3.47	6055.9	3.67
7 . . .	748.7	.23	534.1	..32
Total .	321727.6	——	164975.1	——
Percent	66.10	——	33.90	——

These are not significantly different (x^2=.06, 1 d.f., p=.81).

Table 2-12 defines the injury diagnosis and body part classification used by CPSC. Tables 2-13 and 2-14 give the estimated distribution of bicycle-associated injuries for

Figure 2-5. Distribution of Bicycle Associated Accidents by NEISS Severity Category and Sex

1976

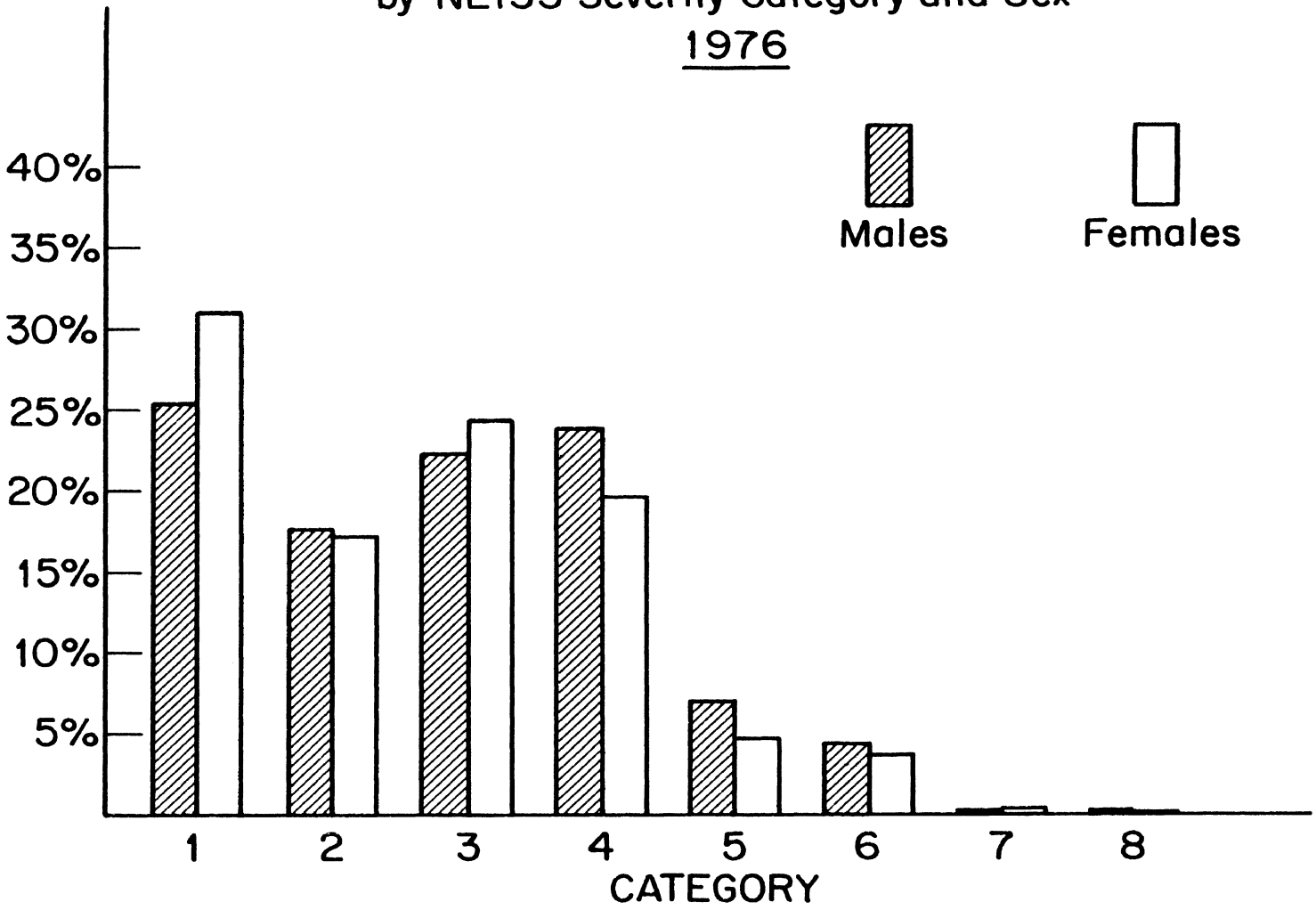


Figure 2-6. Distribution of Bicycle Associated Accidents by NEISS Severity Category and Sex

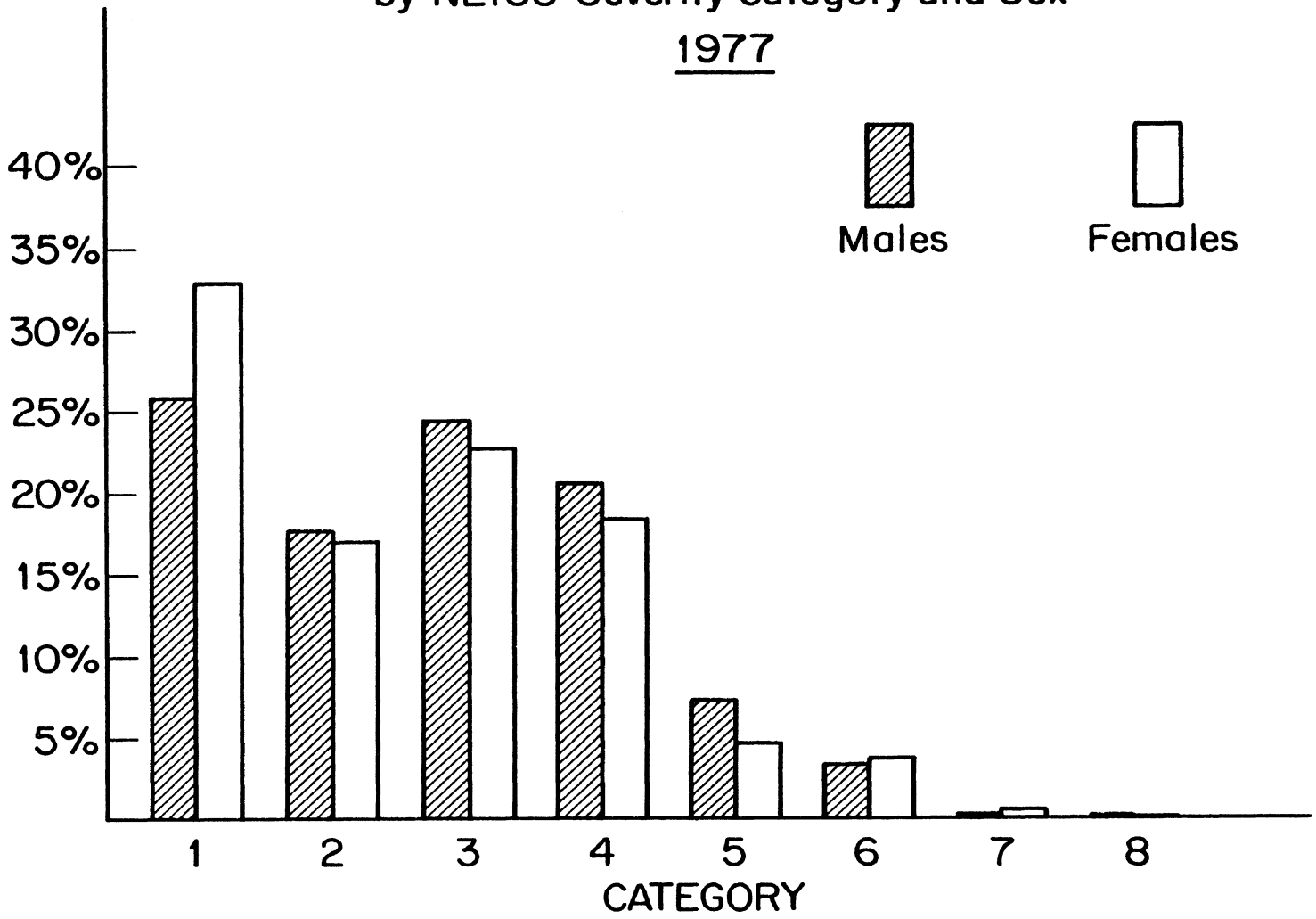


Table 2-10

Estimated Number of Bicycle Injuries by NEISS Severity Category, 1976

Category	Number	Percent
1	120900.0	27.10
2	77695.0	17.42
3	101810.0	22.82
4	99624.0	22.33
5	28225.0	6.33
6	16760.0	3.76
7	755.3	.17
8	282.49	.06

Table 2-11

Estimated Number of Bicycle Injuries by NEISS Severity Category, 1977

Category	Number	Percent
1 . .	138460.0	28.43
2 . .	85382.0	17.53
3 . .	115560.0	23.73
4 . .	97356.0	19.99
5 . .	31572.0	6.48
6 . .	17233.0	3.54
7 . .	1282.8	.26
8 . .	113.88	.02
Total	486959.7	——

these classifications in 1976 and 1977 respectively. The most frequently occurring injuries are: contusions/abrasions (37.1% in 1976, 37.2% in 1977), laceration (34.2% in 1976, 32.6% in 1977), fracture (13.2% in 1976, 8.8% in 1977). Other injuries representing more than 1% of the cases are: concussion (2.3% in 1976, 2.5% in 1977) and hematoma (1.4%

Figure 2-7. Distribution of Bicycle Associated Accidents by NEISS Severity Category

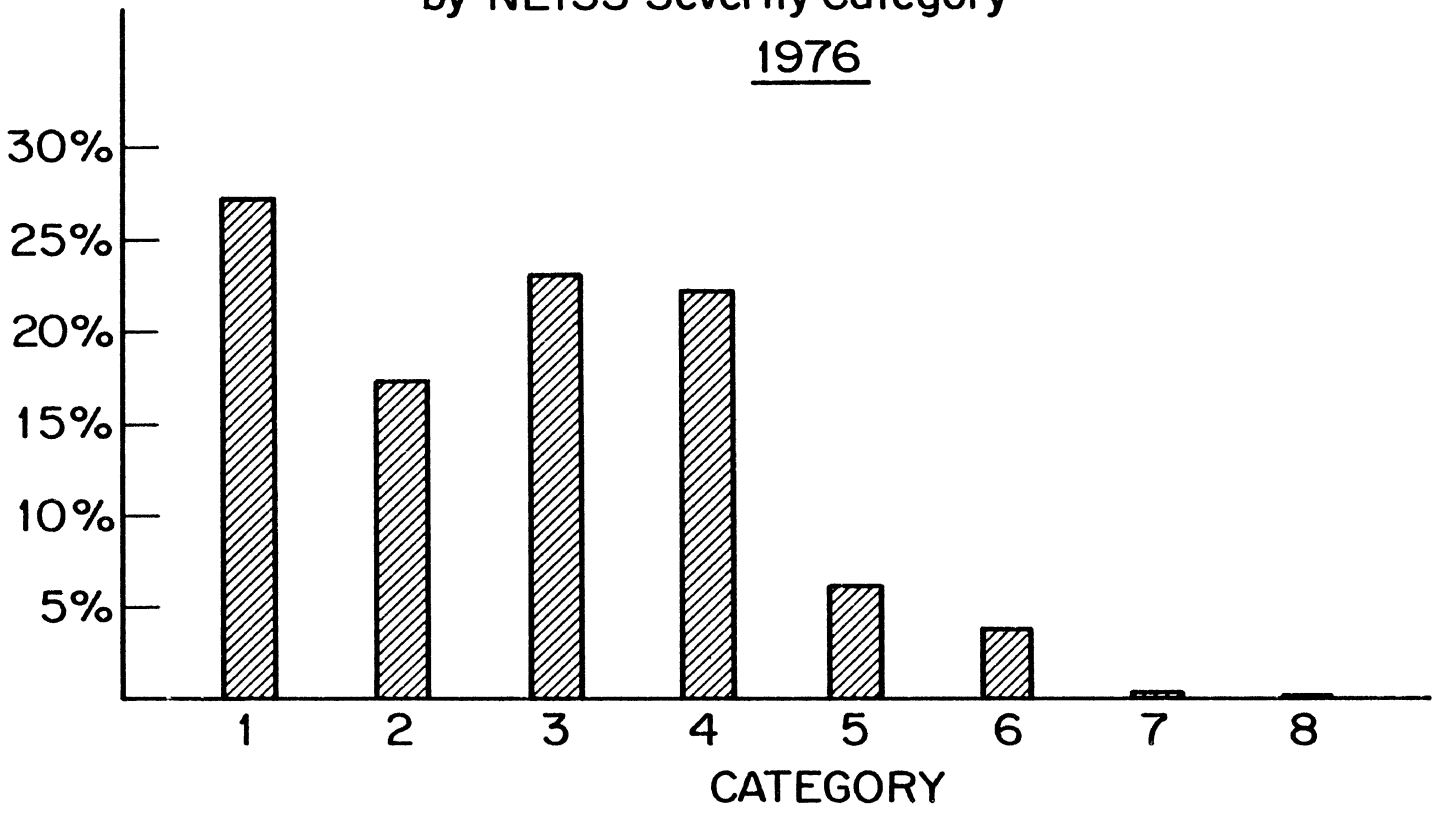
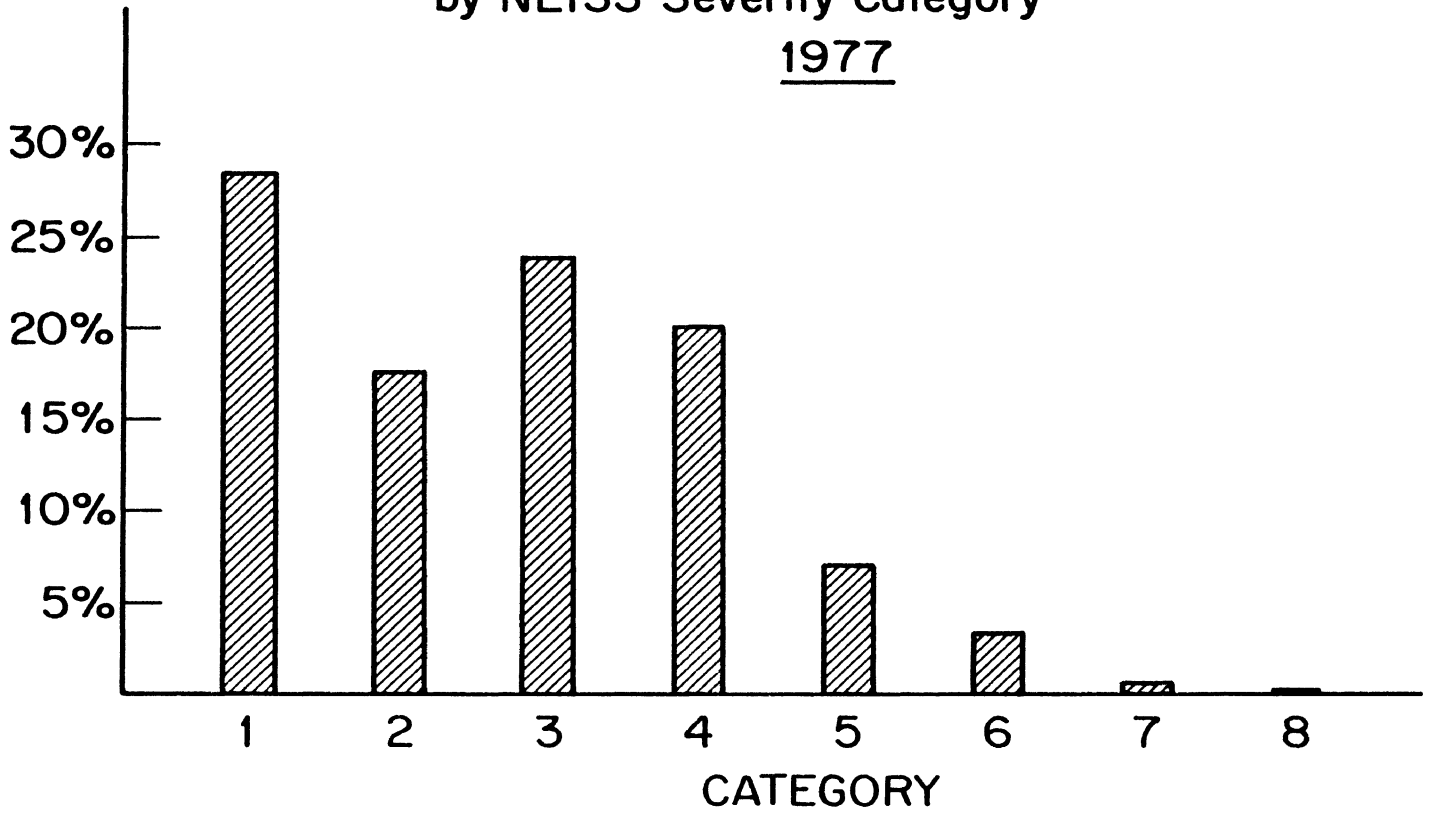


Figure 2-8. Distribution of Bicycle Associated Accidents by NEISS Severity Category



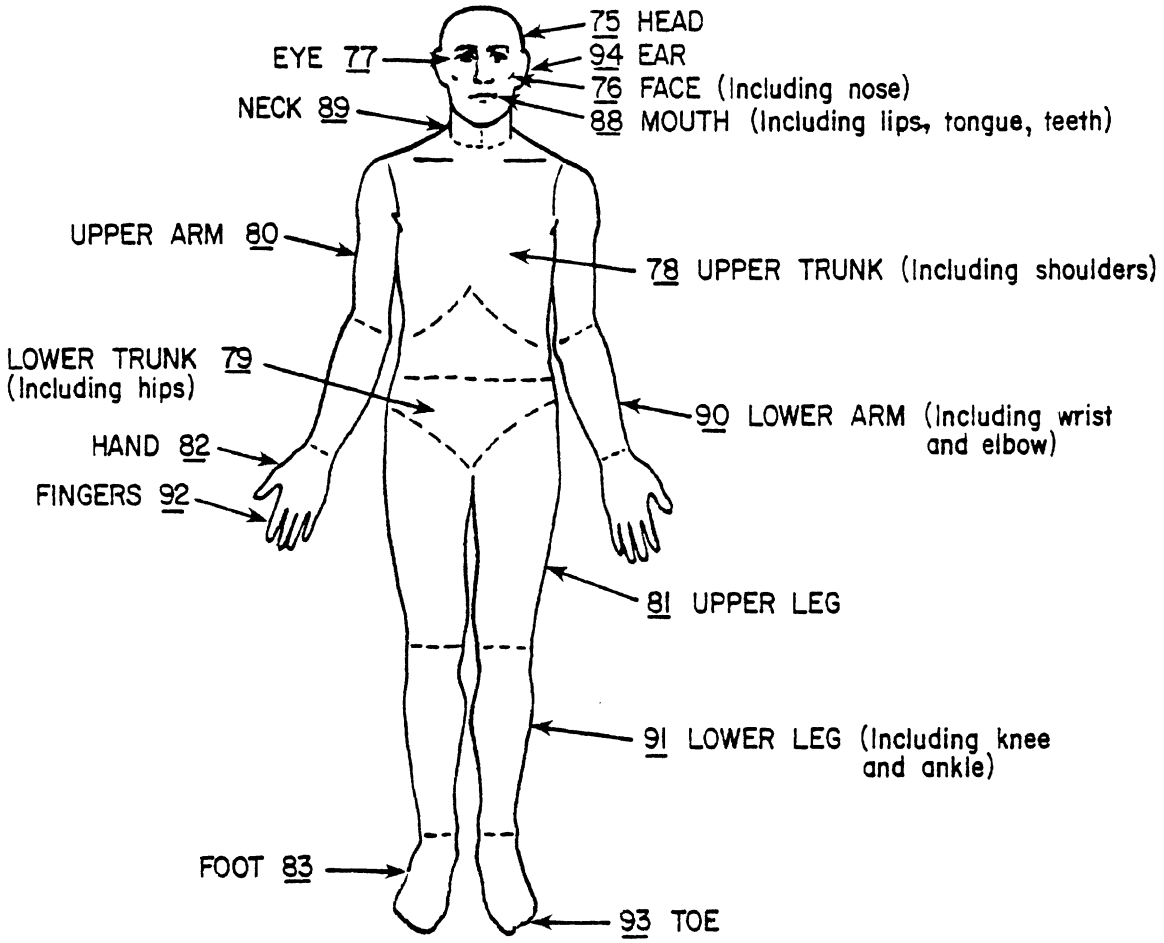
in 1976, 1.7% in 1977). The reduction in fractures in 1977 is encouraging, but unexplained.

The most frequently injured body parts include: lower leg (18.8% in 1976, 20.3% in 1977), face-including nose (16.8% in 1976, 15.0% in 1977), lower arm-including wrist and elbow (14.0% in 1976, 15.2% in 1977), and head (12.6% in 1976, 13.0% in 1977). The extremities (feet, legs, hands and arms) account for 53.7% of the injuries in 1976, 57.5% in 1977, and injuries to the head and face account for 33.6% of the injuries in 1976 and 32.1% of the injuries in 1977.

Table 2-15 gives the proportion of bicycle accidents in the NEISS data for which a motor vehicle was listed as the second product involved. That is, these proportions are the proportions of accidents which were traffic accidents. These proportions are tabled by sex and by NEISS injury severity category. Inspection of Table 2-15 reveals that the proportion of accidents involving motor vehicles is relatively constant at about 5% for the injury severity categories 1 through 5, while it is about twice as large for category zero and rises very sharply for the categories 6, 7, and 8. The zero category consists of those persons who were involved in a bicycle accident and taken to an emergency room. Upon examination, no injury was found. Presumably persons were more likely to have an emergency room visit if they were involved in a bicycle accident with a car even if there was no apparent injury than if it was a simple bicycle accident. The larger proportions of motor vehicle involvements in the higher injury categories, is of course, reflective of the increased seriousness of injury when a motor vehicle is involved.

If the bicycle rider was male, a higher proportion of the accidents involved a motor vehicle than if the rider was female. Motor vehicles were involved in about 6.5% of the bicycle accidents involving males, but only in about 4.0% of those involving females. It appears that if a motor vehicle

TABLE 2-12 BODY PART AND INJURY DIAGNOSIS



INJURY DIAGNOSIS	CODE
Amputation	50
Anoxia	65
Avulsion	72
Burns (not specified)	47
Burns (scale from hot liquids)	48
Burns (thermal)	51
Burns (chemical, caustics, etc.)	49
Cell damage by radiation, except thermal (radiation burns by ultraviolet, x-rays, radio-active materials, etc.)	73
Concussion	52
Contusions/Abrasions	53
Crushing	54
Dermatitis, Conjuntivitis	74
Dislocation	55
Electric Shock	67
Foreign Body	56
Fracture	57
Hematoma	58
Internal Organ Injury	62
Laceration	59
Nerve Damage	61
Poisoning	68
Puncture	63
Strain or Sprain	64
Submersion (including drowning)	69
Other	81
Not stated	70
Ingested foreign object	4100
Aspirated foreign object	4200

BODY PART	CODE
Head	75
Ear	94
Eyeball	77
Face (including nose)	76
Mouth (lips, tongue, teeth)	88
Neck	89
Upper trunk (including shoulders)	78
Lower trunk (including hips)	79
Upper arm	80
Lower arm (including wrist and elbow)	90
Hand	82
Finger	92
Upper Leg	81
Lower Leg (including knee and ankle)	91
Foot	83
Toe	93
25-50% of Body	84
All parts of body	85
Other	86
Not stated	87

was involved, there was an increased likelihood that the bicyclist would be taken to the emergency room for examination. In addition, involvement of a motor vehicle increases the chance of a serious injury--particularly one of the three highest injury categories.

Table 2-13a

Bicycle-associated injuries by body part classification, 1976

Diagnosis	Head	Face (including face)	Eyeball	Upper trunk (including Shoulders)	Lower trunk (including Hips)	Upper arm	Upper leg	Hand	Foot	25-50% of body
47 Burns (Not Spec) . .										
49 Burns (Chemical) . .			20							
50 Amputat'n .										
51 Burns (Chemical) . .							9			
52 Concuss . .	10242									
53 Contusion Abrasion . . .	19013	22509	550	16748	8265	1813	2762	5574	11889	7154
54 Crushing . .	103				22			23	120	
55 Dislocation	68			1070	347	34	6	20		
56 Foreign body			123						6	
57 Fracture . .	89	2242		10879	620	1065	940	2027	1673	20
58 Hematoma . .	119	917	9	57	342		237	99	80	
59 Laceration .	913	48771	118	5469	359	5046	5098	7351	544	
61 Nerve damage										
62 Internal organ injury	2		14	156	772					
63 Puncture . .	699	376		283	41	320	347	135	480	20
64 Strain or sprain				3358	629	125	175	2113	3912	39
70 Not stated .	41	35			10			43	51	
71 other . . .	153	346	38	98	13		9		6	2
72 Avulsion . .	20	57			26		19	156	402	
73 Cell damage by non thermal radiation . . .	6									
74 Dermatitis, Conjuntivitis .	22509		70				10		12	

Table 2-13b

Bicycle-associated injuries by body part classification, 1976

Diagnosis	All parts of body	Other	Not Stated	Mouth	Neck	Lower arm	Lower leg	Finger	Toe	Ear
47 Burns(n/spec) .							2	6		
49 Burns (chemical)										
50 Amputation . . .						18		662	20	
51 Burns (thermal)							8			
52 Concussion . . .										
53 Contusion Abrasion	731		98	1769	352	24341	33556	5966	2892	118
54 Crushing							56	970	57	
55 Dislocation . .				1293	4	516	115	818		
56 Foreign Body . .				39	515	32		34		
57 Fracture				394	34	21124	8897	5833	1492	
58 Hematoma	22			153		474	741	349	103	
59 Laceration . . .	9	258	2	12361	100	7148	24858	7377	3306	720
61 Nerve Damage . .					11					
62 Internal organ injury										
63 Puncture				308		363	288	368	16	19
64 Sprain or strain					327	8272	15032	2233	284	
70 Not stated . . .				48			4			
71 Other					27	2	50	41		146
72 Avulsion				81		192	365	1162	594	
73 Cell damage by non thermal radiation										
74 Dermatitis . . .					2		5			

Table 2-14a

Bicycle-associated injuries by body part classification, 1977

Diagnosis	Head	Face (including face)	Eyeball	Upper trunk (including Shoulders)	Lower trunk (including Hips)	Upper arm	Upper leg	Hand	Foot	25-50% of body
47 Burns(n/spec)					9					
49 Burns (chemical)									14	
50 Amputation								10	19	
51 Burns (thermal)	12007									
52 Concussion	22621	20680	674	17347	9405	1351	3850	7120	13950	7118
53 Contusion/Abrasion					25		9	17	210	
54 Crushing	24	54		1219		122	39	40	40	
55 Dislocation	7	81	62				25	5	20	
56 Foreign body	1698	2359		13197	535	1067	847	1863	2639	155
57 Fracture	3467	1095	68	154	624	6	300	184	459	6
58 Hematoma	22597	48144	251	1400	3305	883	3457	4476	9536	405
59 Laceration					6	56				
61 Nerve Damage										
62 Internal Organ Injury	75			165	218					
63 Puncture	412	365		91	34	8	160	46	48	26
64 Strain or sprain				2843	755	28	413	916	4911	9
70 Not stated										
71 Other	22		8	18	55			34		
72 Avulsion	76	151		30	9			55	310	
73 Cell damage by non thermal radiation										
74 Dermatitis, Conjuntivitis			75	9				5		

Table 2-14b

Bicycle-associated injuries by
body part classification, 1977

Diagnosis	All parts of body	Other	Not Stated	Mouth	Neck	Lower arm	Lower leg	Finger	Toe	Ear
47 Burns(n/spec) . .					2		20			
49 Burns (chemical) .										
50 Amputation				10		35		581	229	
51 Burns (thermal) .							59			
52 Concussion										
53 Contusion/Abrasion	642	25	11	2182	615	27601	38508	5144	2481	128
54 Crushing				10			137	283		
55 Dislocation . . .				759		414	154	1235	133	
56 Foreign Body . . .						11		23		73
57 Fracture				759	177	25687	10462	6570	1654	
58 Hematoma				55	8	269	1213	310	250	21
59 Laceration	43	4		14159	343	8701	28813	9028	2769	719
61 Nerve Damage . . .							4			
62 Internal Organ Injury										
63 Puncture				141	39	33	401	281		48
64 Strain or Sprain					925	10978	18442	2563	212	
70 Not Stated							5			
71 Other	16			11		18	15	298	11	
72 Avulsion				143		128	761	1817	683	9
73 Cell damage by non thermal radiation										
74 Dermatitis, Conjuntivitis							5			

Table 2-15

Proportion of Cases with Motor Vehicle Involvement
by Sex and Injury Severity

Injury Severity	Male	Female	Total
0	0.083	0.136	0.100
1	0.085	0.044	0.068
2	0.049	0.031	0.043
3	0.059	0.036	0.051
4	0.046	0.030	0.041
5	0.060	0.042	0.055
6	0.170	0.104	0.150
7	0.333	0.333	0.333
8	0.800	1.000	0.900

3. FURTHER ANALYSIS OF THE IN DEPTH CASES

The following should be read with consideration given to the source of these data. The in-depth cases are not a random sample of any definable population, and this analysis cannot, therefore, be used to extrapolate to any larger segment of bicycle-associated accidents. As with other clinical studies, the data are useful in providing insights into the accident and injury mechanisms, which can then be pursued in other studies.

The in-depth cases were examined to determine if there were differences between night-time and daytime accidents. Tables 3.1 - 3.8 present this information, where the day was broken into the following four time periods: 12 midnight to 7 am, 7 am to 5 pm, 5 pm to 8 pm, 8 pm to 12 midnight.

Table 3.1 shows the number of accidents by time of day and day of week. There are slight more accidents on Saturday, Sunday, and Monday. Slightly over one-third occurred from 5-8 pm, while about one-eighth occurred in the two "nighttime" categories.

Table 3.2 shows the distribution of the accidents by time of day, and second product (bicycle, motor vehicle, other, or none). Accidents involving cars were nearly four times as common in the midnight-to-7 am period than at other times. Twenty-seven percent of the accidents in this period involved cars, while at other times only about 7% of the accidents involved cars. This suggests that night-time visibility may play a role in these accidentss. However, only 3.4% of the accidents reported occurred in this time period, so that the night-time accidents represent only a small portion of the accidents. However over 40% of the accidents involving cars occurred in the night-time period (Midnight-to-7 am).

Table 3.3 shows the patient disposition by the time of accident. The disposition may be viewed as a crude measure

of severity consisting of death, treated and admitted to hospital, or treated and released. Viewed in this light, the midnight-to-7 am period has more severe accidents - more fatalities - than the other time periods. About 15% of the accidents in this time were fatalities while about 3% of the accidents in other times were fatalities. It should be borne in mind, however, that these accidents were selected to include as many of the fatalities and more severe accidents as possible. The increased severity of injury for these nighttime accidents presmably results from the fact that 42% of them involved collisions with motor vehicles.

Table 3.4 shows the time of the accident vs. the location. A higher percentage of the highway accidents occurred from midnight-to-7 am than did accidents which happened at different locations.

Tables 3.5 and 3.6 show information pertaining to "safety device present" and "safety device in use" vs. time of the accident, respectively. There does not appear to be much difference by time of day in these.

Table 3.7 shows the time of accident vs. BMA/6 approval. There does not appear to be any large differences in time of accident among the groups BMA/6 approved, not BMA/6 approved, and unknown.

Table 3.8 shows the age distribution of injured persons by time of accident. Few differences by time are seen. The overall distribution is similar to that seen in the NEISS data, Table 2-4.

The familiarity of the operator with the bicycle is a possible contributing cause to accidents. The in-depth reports classified each operator by familiarity as follows: 1) owns a bike and expresses knowledge, 2) learning or experiencing a new bike type, 3) learning or inexperienced, 4) unknown. Comparing these familiarity categories with other causes of accidents showed that familiarity was

Table 3.1

Time of Day by Day of Week

Day	12 M 7 am	7 am- 5 pm	5 pm- 8 pm	8 pm- 12 am	Unknown	Total	Percent
Sunday .	3	70	25	6	0	104	(16.1%)
Monday .	2	43	45	7	2	99	(15.3%)
Tuesday .	0	42	37	9	0	88	(13.7%)
Wednesday	1	37	37	9	0	84	(13.0%)
Thursday	2	39	30	7	0	78	(12.1%)
Friday .	1	40	28	12	0	81	(12.6%)
Saturday	4	52	29	11	0	96	(14.9%)
Unknown .	9	4	3	0	0	16	(2.5%)
Total . .	22	327	234	61	2		
Percent .	3.4	50.8	36.3	9.5			

associated with only rough, off-road terrain. That is, those "familiar" with their bicycles were somewhat more likely to be involved in an off-road terrain accident than others.

Table 3.2

Second Product Involved by Time of Day

Time	Bicycle	Motor Vehicle	Other	Not Applic.	Total	Percent
12M-7 am .	0	6	0	16	22	(3.4%)
7 am-5 pm .	5	20	14	288	327	(50.%)
5 pm -8 pm	5	16	16	197	234	(36.3%)
8 pm -12 am	2	5	5	49	61	(9.5%)
Unknown . .	0	0	0	2	2	
Total . . .	12	47	35	552		
Percent . .	1.9	7.3	5.4	85.4		

Table 3.3

Patient Disposition by Time of Day

Time	Treated and released	Treated and admitted	Treated and transferred	Died	Unknown	Total	Percent
12M - 7 am .	5	2	0	4	11	22	(3.42%)
7 am - 5 pm	208	86	5	11	17	327	(50.6%)
5 pm - 8 pm	156	50	7	9	12	234	(36.2%)
8 pm - 12 am	33	21	3	2	2	61	(9.44%)
Unknown . .	2	0	0	0	0	2	(.039%)
Total . . .	402	159	15	26	42	646	
Percent . .	62.2	24.6	2.32	4.02	6.50		

Table 3.4

Location of Accident by Time of Day

Time	Area not suited for Bicycle use	Highway	Neighborhood Sidewalk or Recreation Area	Neighborhood Street	Not Stated	Total	Percent
12 M - 7 am	4	3	1	10	4	22	(3.4%)
7 am - 5 pm	28	9	89	200	1	327	(50.8%)
5 pm - 8 pm	27	8	49	149	1	234	(36.3%)
8 pm - 12 am	7	2	11	40	1	61	(9.5%)
Unknown . .	0	0	0	2	0	2	
Total . . .	66	22	150	401	7		
Percent . .	10.2	3.4	23.3	62.0	1.1		

Table 3.5

Safety Device Present by Time of Day

Time	Yes	No	Unknown	Not Applicable	Total	Percent
12 M - 7 am	8	7	5	2	22	(3.4%)
7 am - 5 pm	154	125	26	22	327	(50.8%)
5 pm - 8 pm	120	69	19	26	234	(36.3%)
8 pm - 12 am	26	24	4	7	61	(9.5%)
Unknown . .	1	1	0	0	2	
Total . . .	309	226	54	57		
Percent . .	47.8	34.9	8.4	8.9		

Table 3.6

Safety Device in Use by Time of Day

Time	yes	No	Unknown	Not Applicable	Total	(percent)
12 M - 7 am	5	7	6	4	22	(3.4%)
7 am - 5 pm	112	124	37	54	327	(50.8%)
5 pm - 8 pm	96	58	23	57	234	(36.3%)
8 pm - 12 am	22	21	8	10	61	(9.5%)
Unknown . .	1	1	0	0	2	
Total . . .	236	211	74	125		
Percent . .	36.5%	32.6%	11.5%	19.4%		

Table 3.7

BMA/6 Approved by Time of Day

Time	Yes	No	Unknown	Total
12 M - 7 am	6	1	15	22
7 am - 5 pm	51	13	263	327
5 pm - 8 pm	42	12	180	234
8 pm - 12 am	5	2	54	61
Unknown . .	0	2	0	2
Total . . .	104	28	512	

Table 3.8

Age by Time of Day

Age	12 M 7 am	7 am 5 pm	5 pm 8 pm	8 pm 12 am	Unknown	Total (Percent)
2 . . .	0	1	0	0	0	1
						0.2%
2-4 . .	0	23	19	4	0	46
						7.1%
5-9 . .	3	108	84	10	0	205
						31.5%
10-14 .	6	114	84	10	0	205
						35.6%
15-19 .	6	46	28	14	1	94
						14.6%
20-29 .	3	15	12	5	0	35
						5.4%
30-39 .	0	9	3	2	0	14
						2.9%
40-49 .	0	5	2	0	0	7
						1.1%
50-59 .	0	3	2	0	0	5
						0.8%
60-69 .	0	2	0	1	0	3
						0.5%
70+ . .	4	1	0	0	0	5
						0.8%
Total .	22	327	234	61	2	
Percent	3.4%	50.8%	36.3%	9.5%		

4. CONCLUSIONS

Analysis of the 1976 and 1977 NEISS data on bicycle accidents has revealed little change in general patterns from 1975. The most evident feature is the large seasonal effect, while a small (not statistically significant) monthly increase in accidents is also noted. A slight shift to older ages for persons involved in bicycle-associated accidents seems to be occurring.

Only about 3% of bicycle accidents investigated in-depth occurred at night (midnight to seven am). However, these accidents were more likely to involve motor vehicles than the other accidents. In addition, these nighttime accidents resulted in more serious injuries than did most of the accidents investigated in depth. While bicycle use at night seems to be rare, when bicycles are ridden at night, they should have adequate illumination. The higher proportion of motor vehicle involvements in the night-time accidents suggests that motorists may not expect bicyclists at night and may have difficulty seeing them. While visibility does not appear to present a problem generally for bicycles, it may be when they are operated at night. As a consequence, extra illumination and extra care for night-time use are suggested.