January 1983
Final Report

DOT HS-806-519

U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

Child Pedestrian Supervision/Guidance

Richard M. Thackray, Jr.
Richard L. Dueker

Applied Science Associates, Inc.
Box 158
Valencia, Pennsylvania 16059

Contract No. DOT-HS-501226
Contract Amount $176,274

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT HS-806 519		

4. Title and Subtitle	5. Report Date
Child Pedestrian Supervision/Guidance	January 1983
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Thackray, Richard M. Jr. & Richard L. Dueker	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Applied Science Associates, Inc. Box 158 Valencia, PA 16059	11. Contract or Grant No. DOT-HS-5-01226
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, DC 20590	Final Report July 1975 - January 1983
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The purpose of this study was to identify and evaluate the pedestrian accident risk associated with play activities performed in and near the street, as well as other situational characteristics, and to develop accident countermeasures emphasizing supervision and guidance. The primary focus of the study was on pre-school children, but early school age children were also studied.

Behavioral observation of children at play on/near the street was conducted in five U.S. cities. Areas choosen for observation had moderate to high child pedestrian accident frequency. Interviews were conducted with a subsample of the children observed and their parents.

Several risk measures were evaluated by comparing magnitude of risk values derived from the observation data for various play activities against the frequency of pedestrian accidents involving these play activities. Inadequate search street entries, child-vehicle conflicts, and time observed in-street were the risk measures selected.

Results included the identification of high risk play activities and evaluation of risk as a function of type of area, selected demographic factors, time of day and day of week.

Nine supervision/guidance countermeasures were identified and an implementation model was specified. A plan for evaluating the countermeasures and implementation model was developed.

17. Key Words	18. Distribution Statement
Pedestrian, Children, Behavioral Observation, Risk Measures, Play Activities, Pedestrian Accident Countermeasures	Available through the National Technical Information Service, Springfield, Virginia 22151

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	104	

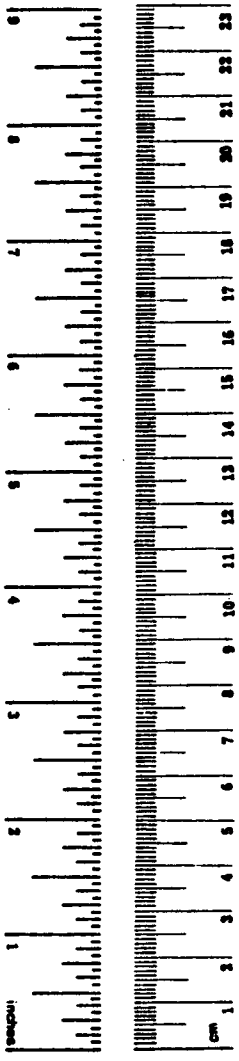
Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

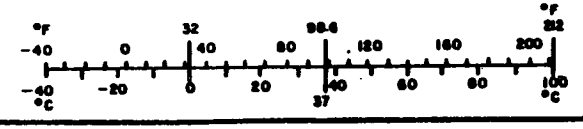
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



ACKNOWLEDGEMENTS

Dr. Marvin Levy, NHTSA, Office of Driver and Pedestrian Research (ODPR), served as the Contract Technical Manager and provided valuable assistance and guidance throughout the project. Dr. Alfred Farina, also of the ODPR, provided very helpful input and feedback to key project tasks.

Dr. William A. Leaf of ASA assisted with the numerous data analyses which were performed and prepared special cross tabulation programs that greatly facilitated reduction of the data. Susan F. Dueker and Janet Stickley, ASA part-time employees, did an outstanding job of coding and classifying all of the field observation and interview data. Ms. Betty Bilotta typed this report and assisted with compilation of the data.

Police departments within each of the field observation cities provided valuable assistance during the planning stages of the project and during the conduct of field data collection.

We would like to acknowledge the excellent support and cooperation provided by officers and Administrative personnel from the following police departments: Miami, Philadelphia, San Diego, San Francisco, Denver.

ADDENDUM

This report used a number of risk measures to identify child play behaviors in and near the street that should be the target of supervisory efforts. The desirability of giving most weight to the frequency of Inadequate Search Street Entries ("ISSEs") as a risk measure is subject to debate. Each of the risk measures used has some problems or difficulties, but taken together they indicate that there are about 10-12 high risk activities that should be the focus of concern for supervisory activities. The reader is urged to review the data on the risk associated with the various child activities rather than selecting the four that account for about half of the ISSEs.

DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

TECHNICAL SUMMARY

CONTRACTOR	CONTRACT NUMBER
Applied Science Associates, Inc.	DOT-HS-5-01226
REPORT TITLE	**REPORT DATE**
Child Pedestrian Supervision/Guidance	January 1983

REPORT AUTHOR(S)
Thackray, Richard M. and Dueker, Richard L.

Introduction

Preschool and young school-age children are heavily victimized by auto-pedestrian crashes. Specifically, children ages 1-9 account for approximately 35% of all pedestrian accidents. According to NHTSA's accident typology system, the majority of these accidents are of the "dart-out" type. Specifically, the child's sudden appearance, usually from between parked cars, is the primary causal factor in these accidents.

Prior NHTSA research also indicated that many of the accidents involving children occurred while the child was playing in or near the street in his own neighborhood. Often, the child's play behavior distracted him/her from traffic and/or interfered with proper search behaviors. Additionally, the lack of parental supervision was identified as a major predisposing factor for many of these accidents. Although not a primary factor, the lack of adult supervision acts to set the stage for such accidents because of the failure to provide monitoring of the children's behaviors and warnings regarding unsafe play habits.

As suggested by prior NHTSA findings, a corrective approach for these accidents would be to provide adult supervision of preschooler's (and young school age children's) near-the-street play activities and/or to provide guidance regarding safe play areas and forms of play. In response to this problem, NHTSA contracted with Applied Science Associates, Inc. (ASA) to conduct a study entitled "Child Pedestrian Supervision-Guidance." The objectives of this study were to:

1. Identify and document child play activities which occur in a street-side or in-the-street setting.

2. Evaluate and rank the above activities in terms of risk and prevalence.

3. Formulate, for each high-risk activity or cluster of activities, supervision/guidance countermeasures which appear to be capable of reducing the hazards associated with these activities.

(Continue on additional pages)

"PREPARED FOR THE DEPARTMENT OF TRANSPORTATION, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION UNDER CONTRACT NO.: DOT-HS-5-01226 . THE OPINIONS, FINDINGS, AND CONCLUSIONS EXPRESSED IN THIS PUBLICATION ARE THOSE OF THE AUTHORS AND NOT NECESSARILY THOSE OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION."

4. Specify a plan for countermeasure implementation and testing.

While the focus of the study was to be preschoolers ages, 1-5 school age children (6-11 year olds) were also to be addressed as resources permitted. Such a focus would provide for broader application of study findings and was consistent with the fact that most street side play groups contain a mixture of preschool and school age children.

Methodology

While prior accident data provided the focus of the study, these data did not provide detailed information concerning the nature and prevalance of street-side play activities. Accordingly, as summarized below, a large-scale field data collection study was designed and conducted.

Specify Surrogate Risk Measures

Since field observations focused on the collection of behavioral data (versus accident data), it was necessary to develop surrogate measures by which the risk associated with observed events could be judged. A number of such measures were identified. As a result of this process, the following measures evolved as the most appropriate means to estimate risk:

1. Street entries which were not accompanied by an Adequate search. (Hereinafter referred to as Inadequate Search Street Entries--"ISSEs".)

2. Situations that resulted in actual child-vehicle conflicts (CVCs). That is, the child came close to actually being hit.

The first measure was selected since search/detection failures have been noted as a major causal factor in accidents involving children. The CVC has clear value as a risk measure. However, this could not be employed as the sole measure, since it was anticipated that relatively few cases would be observed.

The rate at which these measures occurred (per time observed) was also used to determine the relative risk of observed play activities.

Develop Observation and Interview Procedures

Observation and interview procedures designed to document the following were developed and field-tested:

- the extent and nature of supervision/guidance procedures.

- The nature of street-side/in-street activities--e.g., type of game, play locations, number of participants.

- Risk-related measures--street entry behaviors, in-street activities, child-vehicle conflicts.

- Environmental features--parking deployment, street type, traffic volume, residential characteristics.

- The attitudes of parents and children concerning play safety and supervision/guidance procedures.

Conduct of Field Data Collection

Observation areas within the residential sections of five cities* were selected based on a review of relevant accident data, demographic factors and other considerations.

Within each city, two data collection teams (two persons per team) patrolled preselected observation areas by automobile. The team stopped the vehicle and made preliminary observations whenever a child or group of children was detected in a near-the-street setting. A full-scale observation was initiated (from within the parked vehicle) if the group contained one or more children judged to be nine years of age or younger.

Each play site observation lasted for 15 minutes and was followed by an interview of selected children and their parents.

Summary of Results

The subsections below provide a summary of major results: extent and effects of observed supervision, reported guidance procedures, primary target groups, high-risk activities and high-risk time periods.

Extent and Effects of Observed Supervision

Data concerning the prevalence and effects of supervision revealed that:

- Children observed playing in a near-the-street setting were without adult supervision close to 80% of the time observed.

- When supervision was present, it appeared to suppress risky behaviors (i.e., dart-out type street entries,

*Philadelphia, Miami, San Diego, San Francisco and Denver.

in-street play). Specifically, it was found that a child was about 2 1/2 times more likely to dart-out into the street without looking for cars when supervision was absent as contrasted to when supervision was present.

These results suggest that organized supervisory activities could serve as counter measures to play-related accidents.

Prevalence and Nature of Parental/Adult Guidance

Data from interviews with children observed and their parents indicated that:

- Guidance concerning safet play habits/location was provided on a regular basis (e.g., at least once a week) to only about 20 percent of the children. The remaining 80 percent of the children could not recall specific instances of guidance and/or had been provided safety-related instructions at very irregular intervals.

- When given, the nature of the guidance tended to focus on what the child should not do (e.g., "stay out of the street"); few children had received positive instruction on what they should do to avoid being hit by cars (e.g., look both ways before crossing; play only at certain safet locations; play football only when an adult is present).

Primary Target Groups

The results of the field observation indicate that the primary target group should be children 3-9 years old. Males should receive particular emphasis, since they were involved in over two-thirds of the high-risk activities or behaviors.

High-Risk Activities

For the 1-5 year olds, the results of frequency analyses for ISSEs revealed that the following street-side activities should receive primary attention.

1. Directed Walking
2. Non-Directed Walking*
3. Non-Directed Running*
4. Chasing
5. Big Wheel
6. Throwing and Catching Ball
7. Riding Tricycle
8. Kickball
9. Directed Running
10. Throwing Object at Somebody

The first four activities account for 50% of the ISSEs observed.

*Non-directed walking or running involves movement when there was no destination or game apparent to the observer.

Countermeasures should also address the following activities that were often played in the street, and which, as a group, were involved in all of the observed In-Street CVCs:

1. Kickball
2. Tennis
3. Stickball
4. Football

The high-risk street-side activites for 6-9 year olds are:

1. Football
2. Kickball
3. Non-Directed Running
4. Non-Directed Walking
5. Chasing
6. Throwing and Catching Ball
7. Directed Running
8. Throwing Object at Somebody
9. Baseball
10. Riding Big Wheel
11. Roller Skating
12. Riding Bicycle

Of these activities five accounted for 55% of the observed ISSEs.

In addition to the above activities, analysis of the observation data and recent accident data indicates the need for countermeasures to address the following activities which 6-11 year olds frequently played in the street:

1. Football
2. Baseball
3. Kickball
4. Tennis
5. Skateboarding
6. Roller Skating
7. Riding Big Wheel

High-Risk Time Periods

Supervision approaches should concentrate on times of the day and days of the week shown to be high-risk. The study data indicates that the most critical periods are:

- 3:00-7:00 p.m. on weekdays
- 11:00 a.m.-7:00 p.m. on weekends.

Recommended Supervision/ Guidance Countermeasures

Based on analysis of the field observation data, the following supervision procedures have been recommended:

1. Stay with the child
2. Move the play site
3. Modify the game or rules of the game
4. Remove play implements
5. Delimit boundaries

Candidate guidance procedures include training children ages 1-4 in risk avoidance and children ages 5-9 in risk handling.

Conclusions and Recommendations

The primary conclusions of the study are as follows:

1. In general, the street-side play activities of preschool children were unsupervised.

2. When adult supervision was present, it appeared to suppress risky behaviors.

3. A limited number of street-side and in-street activities accounted for a preponderance of the observed risky behaviors for preschool and school aged children.

4. Surrogate risk measures were identified which permitted play activities and other target factors to be differentiated in terms of behavior that could lead to pedestrian accidents.

5. Countermeasures should address the high-risk factors which have been identified (activities, target groups, etc.).

Based on the results of the child pedestrian supervision/guidance study, the following recommendations have been made:

1. The utility and feasibility of recommended countermeasures should be further assessed, and, if warranted, selected countermeasures developed and field-tested.

2. Additional work is needed to further validate the surrogate risk measures developed and employed in this study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SECTION 1

INTRODUCTION

The problem of pedestrian accidents is particularly acute for children ages 1-9: There are approximately 33,000 injuries and 1,500 fatalities annually.[1] A previous pedestrian safety study, sponsored by the National Highway Traffic Safety Administration (NHTSA)[2], indicated that many of the accidents involving children occurred while the child was playing in or near the street in his own neighborhood. Often, the child's play behavior distracted him/her from traffic and/or interfered with proper search behaviors. The majority of these accidents were classified as midblock "dart-outs" or "dashes." In both of these NHTSA accident types, the sudden appearance of the child is the major precipitating or causal factor. Additionally, the lack of parental supervision was identified as a major predisposing factor for many of these accidents. Although not a primary factor, the lack of adult supervision acts to set the stage for such accidents because of the failure to provide monitoring of the children's behavior and warnings regarding unsafe play habits.

As suggested by this NHTSA study, a countermeasure approach for these accidents would be to provide adult supervision of preschooler's (and young school age children's) near-the-street play activities and/or to provide guidance regarding safe play areas and forms of play. Accordingly, the objectives of this study were to:

1. Identify and document child play activities which occur in a street-side or in-the-street setting.

2. Evaluate and rank the above activities in terms of risk and prevalence.

3. Formulate, for each high-risk activity or cluster of activities, supervision/guidance countermeasures which appear to be capable of reducing the hazards associated with these activities.

4. Specify a plan for countermeasure implementation and testing.

---

[1] Accident Facts, Chicago: National Safety Council, 1981.

[2] Snyder, M.B., et al. Pedestrian safety. The identification of precipitating factors and possible countermeasures. Silver Spring, MD: Operations Research, Inc., January 1971.

While the focus of the study was to be preschoolers ages 1-5, school-age children (6-11 year olds) were also to be addressed as resources permitted. Such a focus would provide for broader application of study findings and was consistent with the fact that most street-side play groups contain a mixture of preschool and school-age children.

The remainder of this report is organized into the following sections:

- Section 2 - Methodology and Data Collection
- Section 3 - Data Processing and Analysis
- Section 4 - Results and Conclusions
- Section 5 - Countermeasure Recommendations
- Section 6 - Recommendations for Testing of Countermeasure.

SECTION 2

METHODOLOGY AND DATA COLLECTION

This section describes the major activities that were performed in designing the child pedestrian supervision/guidance study and reviews the conduct of field data collection activities.

Figure 2-1 provides an overview of the activities conducted during the course of the study.

The methodology and data collection phase of the study involved the following activities:

1. Literature Survey
2. Analysis of Child Pedestrian Accident Data
3. Development of Sampling Plan
4. Selection of Observation Cities/Areas Within Cities
5. Development of Observation and Interview Procedures
6. Preparations for Field Data Collection
7. Conduct of Field Data Collection.

Conduct of each of these activities is described separately in the subsections below.

Literature Survey

The purpose of the literature survey was to identify and obtain relevant literature, especially documents providing information on epidemiological studies of child pedestrian accidents and on child play activities, their distribution, and pervasiveness. Sources reviewed in this effort include:

1. National Highway Traffic Safety Administration's Bibliographies of Technical Reports (1967-1974).
2. National Technical Information Service Bibliographies (1972-1974).

PROJECT OVERVIEW

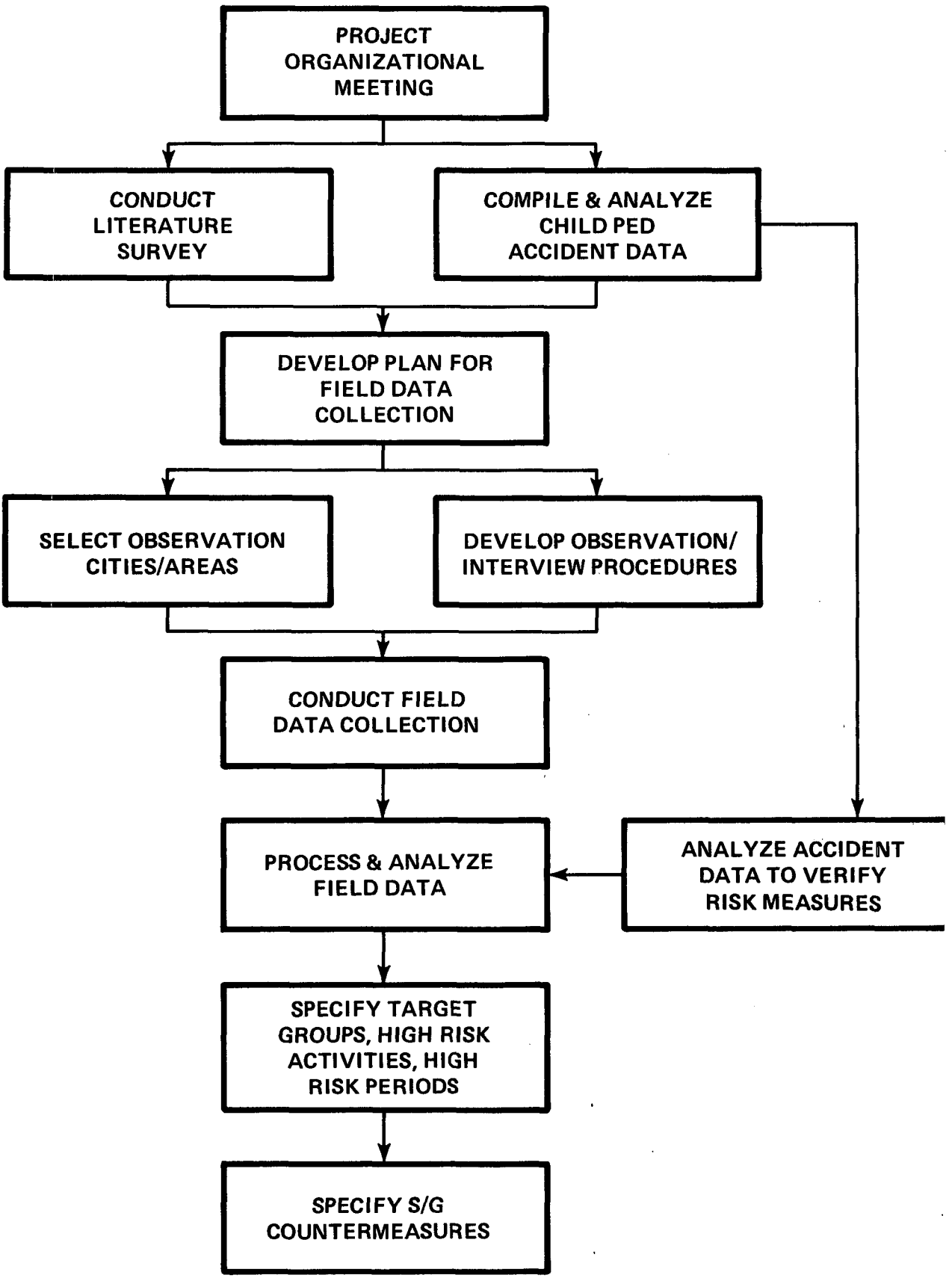


Figure 2-1. Project Overview

3. Psychological Abstracts (1967-1975).

4. Card catalogs, Reader's Guide, and other resource materials at the University of Pittsburgh Libraries, Carnegie-Mellon University Libraries, and Carnegie Free Public Library.

5. Child Development Bibliography from the University of Pittsburgh's Child Development Department.

Over 125 documents were obtained and examined for:

1. Epidemiological data on child pedestrian accidents.

2. Data on child play activities.

3. Data on pertinent methodologies.

Each document identified as relevant was reviewed and abstracted, and a working bibliography, comprised of Data Summary Sheets, was developed. Each Data Summary Sheet contains a bibliographic reference, an abstract, relevant second source references, and space for annotations.

The output of this literature review served as an information base for the conduct of subsequent project activities.

Analysis of Child Pedestrian Accident Data

As described below, child pedestrian accident data from a number of major cities were compiled and analyzed in order to permit:

1. Specification of relevant accident factors (e.g., accident distribution by time of day, day of week, age group, etc.).

2. Determination of cities, and areas within cities, suitable for field data collection.

3. Establishment of an accident data base that could be used later in the study to verify observation-based findings.

Acquire and Compile Accident Data

Since appropriate accident data were already available for 17 cities from previous NHTSA/FHWA work, these cities were selected as candidates for

the on-site observation phase of the study. Accordingly, computer files of pedestrian accident data from the following cities were obtained:

1. Akron
2. Baltimore
3. Boston
4. Columbus
5. Chicago
6. Denver
7. Houston
8. Los Angeles
9. Miami
10. New Orleans
11. New York
12. Philadelphia
13. San Diego
14. San Francisco
15. Seattle
16. St. Louis
17. Washington, DC

Analyze Accident Data

Accident data from the above cities were analyzed to permit specification of the following for each city:

1. Distribution of child pedestrian accidents by accident type, time of day, day of week, age of child, etc.

2. Proportion of all pedestrian accidents that involved children.

3. Proportion of child pedestrian accidents that were classified as play-related.

As described later in this section, the above data were used in the formulation of the sampling plan for field data collection and were employed in the selection of observation cities and areas within cities.

Development of Sampling Plan

The output of the literature survey and the results of the accident analysis were used to structure the Sampling Plan for field data collection. The plan was intended to identify factors related to high-risk play situations and to ensure adequate representation of those factors by the sampling procedures. While a number of issues were examined, the following three factors emerged as being particularly critical for specification in the Sampling Plan:

1. Day of week and time of day during which play observations should be conducted.

2. Target group composition of the sample.

3. Types of observation areas that should be selected.

Each of these factors is discussed below.

Determination of Day of Week and Time of Day During Which Play Observations Should be Conducted

A variety of day of week and time of day considerations were made in order to:

1. Ensure that field data collection would be conducted during periods that have been shown to be high-risk in terms of child pedestrian accidents.

2. Maximize data quantity (i.e., the number of play activities available for observation).

Observation Times and Days. Regarding observation times, the accident data indicated that child pedestrians are heavily victimized between 11:00 a.m. and 9:00 p.m. The accident frequencies fall off sharply before 11:00 a.m. and after 9:00 p.m. Based on these data and target group considerations described below, the decision was made to conduct field observations and interviews from 11:00 a.m. through 7:00 p.m. Observations were not scheduled for after 7:00 p.m., since the onset of darkness would compromise effective data collection.

Accident data relevant to the selection of days on which observations should be conducted indicated that the highest risk days for 0-5 year olds (the target group of prime concern) were Monday, Wednesday, Thursday and Friday, with Sunday showing the lowest rate.

Based on this information, and discussions with the CTM, it was determined that observations would be conducted from 11:00 a.m. to 7:00 p.m. on Monday, Wednesday, Thursday, Friday, Saturday, and Sunday. Saturday was added to the schedule to permit comparison of the difference in risk factors on Sunday versus Saturday.

Determination of Target Group Composition

This task involved specification of the approximate sample proportions for the following:

1. Preschool children (0-5)
2. School-age children (6-11).

Given the focus of the study, it was determined that the majority of the data collected should be for preschool children. However, data regarding the unsafe play activities of school-age children would also be of importance, since these data could be used in identifying supervision/guidance countermeasures that would also benefit this age group. Furthermore, since many play groups are mixed (i.e., both preschool and school-age children), school-age children would be participants in a number of play activities selected for observation. Such a plan would thus add to the efficiency of field data collection.

As indicated in the preceding subsection, field observation and interviews would be conducted from 11:00 a.m. through 7:00 p.m. on every day except Tuesday. Thus, the data collection time frame would be such that (excluding Saturday and Sunday), approximately 50 percent of the observations would be made during school hours (i.e., 11:00 a.m.-3:00 p.m.). The vast majority of the children observed during this time period would be preschoolers. The other half of the data collection period (3:00 p.m.-7:00 p.m.) would cover a period during which both preschool and school-age children would be playing outdoors. During this latter period (and all day Saturday and Sunday), we expected to observe and interview approximately the same number of preschool children as school-age children. That is, some groups would be comprised of only preschoolers, some only school-age children, and others would be mixed.

Overall, this plan effectively satisfied the need to emphasize observation of preschoolers without ignoring the older children.

Determination of the Types of Observation Areas to be Selected

Since data collection would be conducted within selected areas of each observation city, the purpose of this task was determination of the types of areas to be selected for observation. As described below, accident rate and population density factors were considered in making this determination.

Accident Rate Considerations. Given the focus of the study, it was determined that the majority of the observations and interviews should be conducted in areas within each city with the highest accident rates for preschoolers. However, it was also decided that it would be valuable to conduct a certain percentage of the observations and interviews in areas that, although having a relatively large population of children, have not experienced a high number of child pedestrian accidents. Such an approach would facilitate:

1. Documentation of the factors that distinguish low and high accident areas (e.g., street type, parking deployment, traffic volume, population density, presence/absence of safe play areas, supervision/guidance/procedures).

2. Broader based generalizations of the findings. That is, it is likely that low/moderate risk areas identified in certain large cities would be representative of the moderate- to high-risk areas found in small- to medium-sized cities.

For these reasons, it was decided that, within each city, approximately 75 percent of the observations would be concentrated in the highest accident rate areas, with the remaining 25 percent of the effort being spent in areas with a low to moderate rate of child pedestrian accidents.

Population Density. It was determined that the population density associated with potential observation areas should be accounted for in the Sampling Plan since:

1. The accident rate associated with a particular observation area is likely to be partly a function of the area's population density.

2. Important environmental factors (e.g., type of housing, presence or absence of front yard, street type) would vary as a function of population density.

Based on these considerations, it was decided that:

1. Census tract data would be used to specify the population density of potential observation areas.

2. Consistent with the other selection criteria, observation cities and areas within cities would be selected that, as a group, provided a reasonable cross section in terms of population density.

Selection of Observation Cities/ Areas Within Cities

Once the Sampling Plan was developed, work proceeded on the selection of cities and areas within these cities in which to conduct field data collection.

This selection process involved the following steps:

1. Identification of potential observation cities and areas within cities.

2. Specification of procedures/criteria for selection of observation cities and areas within cities.

3. Selection of three southern observation cities.

4. Selection of two northern observation cities.

Identification of Potential Observation Cities and Areas Within Cities

Seventeen cities were considered as potential observation cities. While accident data were obtained from each of these cities, the data from certain cities were not adequate for purposes of the cities' selection process. In particular, a number of cities were unable to provide information concerning the precise location (i.e., street address) of each accident. Since these data were necessary for the plotting of within

city accident distributions, cities not supplying this information were dropped from further consideration. Accordingly, the cities listed below, for which accident location data were available, were evaluated. The cities are listed by geographical (climatic) location, since this was a factor in the Sampling Plan.

Southern Cities

1. Los Angeles
2. San Diego
3. San Francisco
4. Miami

Northern Cities

1. Columbus
2. Philadelphia
3. Denver
4. Washington, DC
5. Akron

1. A detailed map of the city was used to plot (with pins) the location of accidents involving pre-school children up to age 4. The decision to plot only the accidents for 0-4 year olds (versus 0-4 and older children) was based on the assumption that these pins would more accurately reflect high risk play areas. That is, since many accidents involving older children are not play-related (e.g., they occur on the way to and from school) plotting of accidents for this group could obscure the identification of high-risk play areas.

2. Residential areas with the highest number of pins were identified. Each area was plotted so that it would be approximately one square mile in size. At least six such high accident rate areas were identified in each city.

3. Likewise, approximately six low/moderate accident areas were identified for each city.

4. Next, census tract data were used to describe the following for each area:

   a. Total population (population density).

   b. Population of 0-4 year olds.

Specification of Procedures/Criteria for Selection of Observation Cities/Areas Within Cities

The criteria used for selecting these cities and areas were based on the specifications of the Sampling Plan and were as follows:

1. Proportion of the cities' pedestrian accidents which involved 0-4 year olds and, data permitting, proportion

of the latter which were classified as play-related. In general, the cities selected showed, in comparison with other cities, a relatively high incidence of accidents for the 0-4 age group.

2. The accident rate (per year) associated with each of the potential within-city observation areas.

3. Population density within and across cities. Areas were selected that, as a group, provided a cross section in terms of population density.

4. Racial and ethnic characteristics of each of the potential within-city observation areas. In selecting core areas, no attempt was made to achieve a particular percentage of representation for a given racial or ethnic group. However, within the constraints of the other selection criteria, the areas selected provided, as a group, a reasonable balance in terms of racial and ethnic characteristics.

5. Climatic considerations entered into the selection process, since constraints of the project schedule required that field data collection commence in December and be concluded in the following May. Specifically, it was necessary to select and schedule warm climate cities during the winter months in order to maximize the opportunity for observation of pre-schoolers.

Based on the above considerations, it was determined that:

1. Three southern cities would be selected.

2. Two northern cities would be selected.

3. Within each city, five high-risk areas and three low/moderate risk areas would be selected.

Selection of Three Southern Observation Cities

The four southern cities under consideration were Los Angeles, San Francisco, San Diego and Miami.

The evaluation process described above was applied to each of these cities. As a result of this process, the following three cities were selected: San Francisco, Miami and San Diego.

The five high accident rate and three low/moderate accident rate areas were selected for each city.[3]

Selection of Two Northern Observation Cities

The five northern cities under consideration were: Columbus, Philadelphia, Denver, Washington, and Akron.

The previous described evaluation process was applied to each of these cities. As a result of this process, Philadelphia and Denver were selected.

The five high accident rate and three low/moderate accident rate areas were selected for each city.

Development of Observation and Interview Procedures.

Concurrent with the selection of observation cities, work proceeded on the development of the procedures to be used during conduct of field data collection.

The formulation of observation/interview procedures for sampling, observing and documenting potentially high-risk play situations involved the following steps:

1. Specification of data collection parameters.
2. Development and testing of data collection procedures and forms.
3. Specification of scheduling plan for conduct of within-city data collection.

Conduct of each of these activities is described below.

[3] In the first city visited (Miami), only three high accident rate areas were employed. Following this trip, the Sampling Plan was modified to include five high accident rate areas, since we found that three high accident rate areas could be thoroughly canvassed in less time than originally envisioned.

Specification of Data Collection Parameters

Field observation/interview data collection parameters were specified which:

1. Would permit documentation of the range of variables associated with unsafe child pedestrian play situations. These include behavioral, environmental, and attitudinal variables.

2. Would facilitate documentation of factors that could be used in identifying possible countermeasure approaches (e.g., play activities, locations, target groups).

3. Could be realistically observed and recorded in an actual field observation situation.

With these objectives in mind, parameters for the following data collection activities were specified:

1. Play site observations.

2. Child interviews.

3. Parent interviews.

Observation Data Parmeters. It was determined that the following data would be collected during each play site observation:

1. Type of play-related activity and narrative describing activity.

2. Location of activity (e.g., distance from intersection, curb, house; on front lawn; in vacant lot; in driveway).

3. Play group size.

4. Estimated age of children.

5. Sex and race of children.

6. Presence, location, and actions of supervisory adult(s).

7. Existence and nature of adult supervision/guidance.

8. Type of area (e.g., residential, residential/commercial).

9. Type of housing (e.g., one-family homes, multi-family homes, apartments).

10. Presence and size of front yard(s).

11. Presence and size of back and/or side yard(s).

12. Presence and location of driveways, alleys.

13. Sidewalk presence, width, and location.

14. Street width.

15. Street type.

16. Street address.

17. Presence and location of parked cars.

18. Presence and type of traffic controls.

19. Traffic volume.

20. Weather conditions.

For selected children in the play group, the following would be documented:

1. Moment-to-moment location and nature of play activity.

2. Moment-to-moment nature of adult supervision/guidance.

3. Number of street entries.

4. Searches (visual and/or auditory), if any, made during street entry.

5. Number of Child-Vehicle Conflicts (CVCs).

6. Nature of each CVC, that is:

    a. Who (driver or child) made first reaction.

    b. Car lengths from child at the time of the first reaction.

    c. Type of reaction made by driver and/or child.

Child Interview Data Parameters. Immediately following the observation period, each observed child would be interviewed (child's cooperation permitting) to determine the following:

1. Child's age.

2. Location of child's home.

3. Where parents are.

A sample of the children (two or three) would be interviewed regarding the following:

1. The games they play most often.

2. Their perceptions regarding the dangers (from a CVC) of these games.

3. Locations of their frequently used play sites.

4. Their perceptions of the safety of the play sites.

5. Willingness to use "safe" play areas.

6. What, if any, supervision/guidance their parents typically provide.

7. Willingness to accept parental and/or nonparental supervision/guidance.

Parent Interview Data Parameters. After approximately every third observation, one or two parents would be interviewed concerning the following:

1. What, if any, supervision/guidance the parents typically provide.

2. Location of their child's frequently used play areas.

3. Availability of supervision/guidance at these areas.

4. Parent's attitudes towards children's use of these areas.

5. Judged safety of these play areas.

6. Perceived need for supervision/guidance at these play areas.

7. Parent's willingness and availability to act as a supervisory/guidance agent.

8. Availability of people in immediate neighborhood to provide supervision/guidance.

9. Attitudes towards nonparental supervision/guidance for their children.

10. What types of supervision/guidance appear to be required in their neighborhood.

11. Reactions to illustrations of selected supervision/guidance procedures (e.g., "What would you think about

using school crossing guards to patrol the children's play area(s)?").

Development and Testing of Data Collection Procedures and Forms

The approach to development of the data collection procedures and forms involved three steps:

1. Development of Tentative Procedures and Forms. Utilizing output from the Specification of Data Collection Parameters task, data forms were developed which would permit efficient recording of the required data. Next, procedures for the conduct of observation/interview activities were specified.

2. Conduct of Pilot Testing. The data collection forms and procedures were pilot tested for a total of five days in the city of Pittsburgh. The pilot tests were conducted in areas identified from pin map data as having a high rate of child pedestrian accidents.

3. Revision of the Forms and Procedures. Following each day of pilot testing, the observation and interview data were reviewed, problems discussed, and revisions were made. The product of this process was a set of forms and procedures judged adequate for field data collection.

Specification of Scheduling Plan for Conduct of Within-City Data Collection

Based on sampling considerations, it was determined that within each city, six days of data collection would be conducted in each of the three high accident rate areas (a 75/25 percent distribution). The results of data collection in Miami (the first city visited) revealed, however, that six days in each of the high-risk areas resulted in over-sampling (i.e., a number of the play groups observed during one of the first four days were reencountered on the fifth or sixth day). Accordingly, the Sampling Plan for the remaining cities was modified as follows:

- Four days of data collection would be spent in the three originally selected high-risk areas.

- Two additional high-risk areas were selected within each city, and allocated three days of data collection each.

- The original plan to spend two days in each of the low-risk areas was maintained.

Within the above constraints, a within-city scheduling plan was developed which achieved a counter-balancing of:

1. High-risk areas and low/moderate risk areas across days of the week.

2. High-risk four-day areas and high-risk three-day areas across days of the week.

This plan thus permitted straightforward summary and analysis of the data across days of the week and type of area.

Preparations for Field Data Collection

The major preparations for field data collection consisted of obtaining necessary support from the police department in each of the study cities, and the recruitment, selection, and training of field data collectors. Conduct of these activities are described below.

Obtaining Police Department Support

In each of the five cities in which data collection was conducted, arrangements were made for support by the local police department. These arrangements were made well in advance of the arrival of the project staff in the city. Initial contact with the police departments was made through the Chief of Police who directed us to either the traffic services or community relations division. Once an agreement to provide support had been reached, the Project Director conferred with the police officer in charge. During this conference, the objectives of the study were reviewed, possible problem areas discussed, and the types of support required from the police department specified.

Recruitment, Selection, and Training of Field Data Collectors

The selection of field data collectors was begun early on in the project. The leaders of the two data collection teams were ASA Project Associates, both with past experience on similar projects. In addition, the Project Director served as a team leader when needed and often accompanied the teams to review/critique their data collection procedures.

Since each team was to consist of two data collectors, arrangements were made to secure the services of persons living in the observation cities. In order to locate qualified and, preferably, experienced personnel, ASA contacted the placement offices of the major universities and colleges within each of the five observation cities.

Applicants were interviewed on-site by the Project Director, along with one or both of the team leaders. Those selected for participation in

the project were then briefed on their responsibilities and undertook an intensive training program consisting of review and explanation of the forms and procedures, as well as actual field experience.

For the field training, observations were conducted in a manner identical to that used during actual observations, with the exception that both team leader and assistant observed the same child or children. This permitted a check of inter-rater reliability, in addition to pointing out any misconceptions on the assistant's part.

Conduct of Field Data Collection

Each day of field data collection began with the two teams (two persons per team) in their respective observation areas at 11:00 a.m. All streets within each area were patrolled by automobile, according to a pattern that assured equal coverage of all residential streets.

The observation team stopped the vehicle and made preliminary observations whenever a group of children was detected in a near-the-street setting. A full-scale observation was initiated (from within the vehicle) if the group contained one or more children judged to be nine years of age or younger. Once a group had been approved for observation by the team leader, an inconspicuous parking place, affording an ample view of the group, was sought.

After parking, the team leader assigned children in the group for observation, with each member usually taking no more than two. If there were more than four children in the group, the youngest were chosen for observation. This served to place the emphasis on pre-school children while at the same time permitting efficient use of all patrol team members. Most observations lasted for a full 15 minutes; however, under the following conditions, observations were cut short after five or ten minutes:

1. Adult supervision was continually present at the site for the first five minutes of observation.

2. No street entries were made during the first ten minutes of observation.

Additionally, observations were terminated if all children went out of sight and did not return within three minutes.

Each full-scale observation was recorded on the play observation form illustrated in Figure 2-1. The date, area, and observation number were entered on the form, as well as the child's racial/ethnic characteristics, sex, and approximate age. Other information recorded on the form included the following:

- Time. The time was recorded by the data collector every 30 seconds, based on a tape with a recorded time message played during the observation period.

DATE _____ DATA COLLECTOR _____

CLOTHING _____

R/E _____ SEX _____ AGE _____

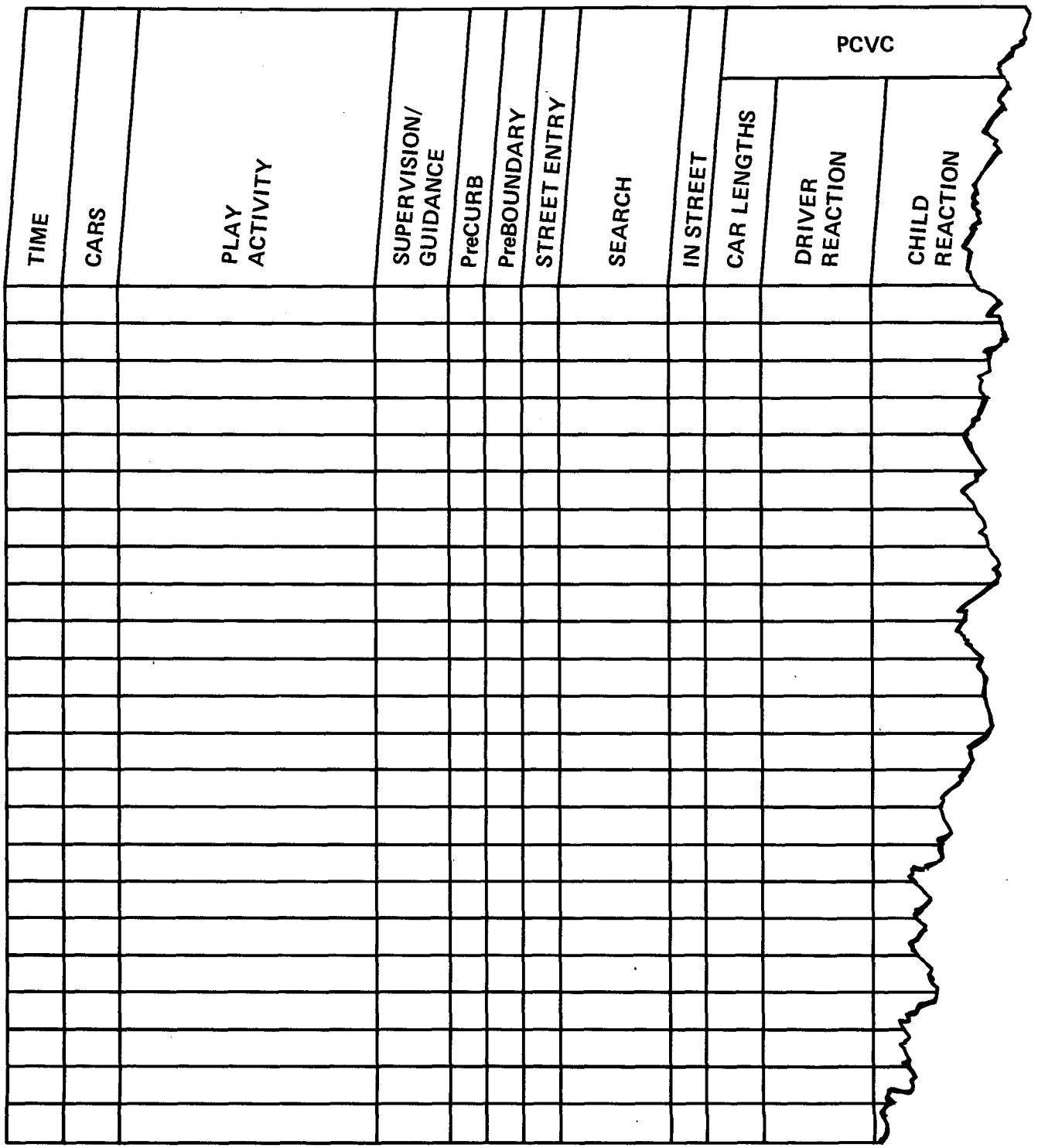


Figure 2-2. Play Observation Form

- Cars. Each car passing the play site was entered on the form.

- Play Activity. The type of activity in which the child was engaged was recorded, and changed as many times as necessary in the course of the observation. Specificity was stressed, especially in terms of identifying play actions or implements.

- Supervision/Guidance. The presence or absence of supervision and/or guidance was carefully noted, as well as the number of adults providing any. Three categories of supervision/guidance were defined:

  - Direct Supervision, where the supervising agent was close enough to the child to physically restrain his/her street entry should the need arise.

  - Indirect Supervision, involving an agent who was continuously present and watchful, but who was not close enough to physically prevent a street entry. The agent could, however, warn the child.

  - Guidance, which involved the agent not continuously present, but who appeared one or more times during the observation to provide information to the child relating to safe play behavior.

- Where Play Was Occurring. The locus of the play activity was indicated (e.g., front yard, sidewalk, preboundary area, in-street.).

- Street Entry. First half or second half of the street was indicated whenever the child entered the active (or potentially active) section of the street.

- Search. In the event of a street entry, the child's search behavior, if any, was carefully observed and recorded.

- Child-Vehicle Conflict (CVC). This designation, subdivided as noted below, was used to record any interaction between a child and a motor vehicle. The CVC might be of either the street-entry type, wherein the conflict occurred while the child was in the process of entering the street, or the in-street type, wherein the child was already in the street (playing or lingering) immediately before the interaction. When a CVC occurred, car length at first reaction (driver or child) was noted, as well as the reactions of both the child and the driver.

In addition to completing the play observation form, the team completed a four-page supplement providing environmental and other data for each observation. At the close of the observation period, the team interviewed, using prestructured forms, a sample of the observed children and their parents, if possible.

SECTION 3

DEVELOPMENT AND EVALUATION OF RISK MEASURES

Field data collection activities provided a wealth of potentially useful information. As described in this section, these data were carefully evaluated to determine the most appropriate risk measures. During this phase of the study, analyses of accident-based data were also conducted to augment the observation-based data provided by field data collection.

This section describes the conduct and output of the following activities:

1. Development of measures to estimate the risk associated with observation-based data.

2. Development of measures to estimate the prevalence of observed activities.

3. Validation of risk measures through analysis of accident data.

4. Specification of preferred risk measures.

Measures Employed to Estimate Risk

Since the field observations focused on the collection of behavioral data (versus accident data), it was necessary to develop surrogate measures by which the risk associated with observed events could be judged. A number of such measures were developed and evaluated. As a result of this process, the following measures evolved as promising means by which to estimate risk:

1. Street entries which were not accompanied by an adequate search.

2. Street entries that met many of the criteria specified for the dart-out accident types (e.g., occurred between parked cars, were not accompanied by adequate search, adult supervision was not present).

3. Situations that resulted in child-vehicle conflicts (CVCs). That is, the child came close to actually being hit.

The first measure was selected since search/detection failures have been noted as a major causal factor in accidents involving children.[4]

The "dart-out" measure represents a logical extension of the first measure and includes factors that often predispose child pedestrian accidents (e.g., parked vehicles).

The CVC has obvious value as a risk measure. However, this could not be employed as the sole measure, since relatively few cases were observed.

Each of these measures is discussed further below.

Inadequate Search Street Entry (ISSE)

For all children observed, a total of 2,119 street entries were documented during the course of data collection in the five study cities. Of these entries, 4.0 percent involved an adequate search (e.g., left and right); 5.7 percent involved a search in only one direction; and 90.4 percent involved no search in either direction. From the standpoint of risk, street entries which were not accompanied by an adequate search pose the greatest danger. Therefore, the frequency of ISSEs was considered as one indicator of risk. An ISSE was defined as a street entry involving no search or an incomplete search.

Dart-Out Street Entry

In order to further estimate the risk to be associated with given street entries, analyses were undertaken to identify entries which appeared to meet the situational factors associated with the dart-out accident type.

The criteria described below were selected as representing the best match between the existing study data (i.e., variables for which field documentation was obtained), and the predisposing and precipitating factors for the dart-out accidents as specified in the NHTSA study referenced in Section 1.[5] Specifically, a street entry was classified as resembling a dart-out if it met all of the criteria below:

1. The child did not conduct an adequate search of either traffic lane before or during his street entry.

2. The child's entry extended into an active traffic lane.

3. On the side of the street from which the entry was made, at least two vehicles were parked within 10 car lengths of the point of entry (most cases involved five or more vehicles within this 10 car length boundary). Thus, the entry was made between/near parked cars that could have served to impair child/driver detection.

---

[4] Snyder, et al, 1971.

[5] Ibid.

4. The child was less than 12 feet from an active traffic lane when he started his excursion into the street. That is, prior to entry, he was near enough to the parked vehicles to be obscured by them and, given his short distance from the street, it is likely that his appearance to a driver would have been sudden.

5. The street had a traffic volume of at least one car every three minutes (most streets had a much higher volume of traffic). Thus, the entry occurred on a street where the possibility of a collision did exist.

6. Adult supervision was not present at/near the play site.

Out of the total of 2,119 street entries, 1,013 (47.8 percent) met each of the above criteria. Comparisons of the ISSE data and the data for the subset of ISSEs meeting the dart-out criteria revealed that across a number of variables (e.g., age, type of activity) these two risk measures had very similar distributions. The fact that particular street entries happened to meet the dart-out criteria appears to be largely due to environmental factors (e.g., presence of parked cars, sidewalk width/location) and not a function of any of the major independent variables (i.e., type of game, child's age, group size).

Child-Vehicle Conflicts (CVCs)

Child-vehicle conflicts were defined as a situation in which the driver and/or the child had to make a sudden reaction in order to avoid a child-vehicle collision. For the driver, this included:

1. Altering course (e.g., moving into the opposite traffic lane, swerving).

2. Decelerating (e.g., slowing down, locking brakes).

3. Warning the child (e.g., blowing horn, yelling).

Child reactions included:

1. Altering course (e.g., changing angle of street entry).

2. Accelerating or decelerating (e.g., running versus walking across street; coming to a rapid stop in the preboundary area).

3. Changing location (e.g., running from street to curb, moving to edge of active traffic lane).

The distance of the car (in car lengths) from the child at the time of the first reaction (driver or child) was documented during field observations. Cases in which the car was more than five car lengths from the child were excluded from the data analysis.

CVCs were classified into two types:

1. Street Entry CVCs. The child was in the process of entering the street from a street-side location (e.g., sidewalk) when the CVC occurred.

2. In-Street CVCs. The child was in the street (e.g., playing or lingering) prior to interaction with the automobile.

A total of 372 CVCs were observed: 130 (34.9 percent) were of the street entry type; 242 (65.1 percent) were In-Street CVCs.

Table 3-1 presents a breakdown of the CVC data for the two types--Street Entry versus In-Street--by the car length separation of the time of the first reaction (driver or child). These data reveal that the Street Entry type typically involved closer conflicts. For example, 36 percent of the Street Entry type involved a separation of one car length, or less, while one car length was noted for only 16 percent of the In-Street CVCs.

Table 3-1

Number of Car Lengths Separation
(at Time of First Reaction) by CVC Type*

Car Lengths	Street Entry	In-Street
1	36.1	16.5
2	32.3	41.3
3	14.6	15.3
4	10.8	21.1
5	6.2	5.8
TOTAL	130	242

*Table figures are percent of total column CVCs.

The closer conflicts for the Street Entry CVCs is due to the fact that, in most of these cases, the child appeared suddenly in front of the vehicle. Thus, the child/driver had little time to react. On the other hand, In-Street CVCs often did not involve extremely close conflicts since the child/driver often saw each other before the CVC developed. Nonetheless, for reasons discussed later in this subsection, In-Street CVCs were judged to be a valid surrogate risk measure.

Measures Employed to Estimate Prevalence

The prevalence of observed events was specified by one or both of the following. Although not risk measures by themselves, these time measures provide a baseline against which to judge the significance of the risk measures described above.

Overall Time Observed

This refers to the overall number of minutes a given event was observed. For example, if four children in a play group were observed for 15 minutes each, the total time observed (total person-minutes observed) would be 60. The sum total for all events observed during the study was 387.9 hours.

Time Observed in Street

A subset of overall time observed, this measure specifies the number of minutes an event was observed to take place in the active traffic lanes of the street. Of the total time observed (387.9 hours) 24.5 hours (6.3 percent) represented in-street activities.

Validation of Risk Measures

As described above, four different surrogate risk measures were used to assess the potential risk associated with observed activities:

1. Inadequate Search Street Entries (ISSEs).
2. "Dart-Out" Street Entries (a subset of 1, above).
3. Child-Vehicle Conflicts (CVCs) subdivided into two types:
    a. Street Entry CVCs
    b. In-Street CVCs.
4. Time spent in the street.

Each activity (e.g., "Riding Big Wheel") observed during field data collection was classified in terms of each of these measures. The measures were manipulated in a number of ways in an attempt to arrive at the actual riskiness of a given activity. This process proved to be fruitless for a number of reasons, the primary shortcoming being the amount of speculation involved. That is, since the risk to be associated with a particular activity could be specified by a number of surrogate risk measures, it was difficult to determine which measure was most appropriate in terms of real-world risk.

In order to rectify this situation, we decided to conduct a thorough review of relevant accident data and examine the correlation between accident data and the data for each of our surrogate risk measures. This process is summarized below.

Compile Play-Related Accident Data

The first step in the analysis of accident data involved identifying cases (accident reports) which involved 1-11 year olds and which, from the report narrative, could be determined to be definitely play-related.

Figure 3-1 provides an overview of this accident analysis process.

Approximately 17,000 cases from three pedestrian accident data bases were searched, and the hard copy reports for all cases involving 1-11 year olds were reviewed. A total of 711 reports were found which indicated that the child was engaged in a specified play activity prior to the accident. In this respect, it must be emphasized that the figure of "711" is in no way representative of the percentage of cases that might have involved play. Typically, this type of detailed information is not recorded by officers who complete accident reports.

Of the 711 cases, 243 involved 1-5 year olds and 468 involved 6-11 year olds. In preparation for the analyses described below, these accident cases were classified into two types:

1. Cases where the child was playing street-side, entered the street and was struck. Most of these cases were of the dart-out or dash type.

2. Cases where the child was playing in the street prior to arrival of the vehicle that struck him.

The street-side cases were analyzed to estimate the validity of ISSEs, Dart-Out Street Entries, and Street Entry CVCs as surrogate risk measures. In-Street cases were examined to assess the validity of In-Street CVCs and time observed in street as surrogate risk measures.

Categorization of Accident Data for Street-Side Activities

The street-side accident cases for 1-5 year olds and 6-11 year olds were reviewed and categorized by activity.

Since the accident report narrative usually did not specify the play activity in great detail, it was necessary, in certain cases, to establish activity descriptions that were somewhat more general than those used for the observation data.

As an example of this process, a listing of the accident-based activities for 1-5 year olds is provided in the first column of Table 3-2. The second column of this table presents the observation-based counterpart(s)

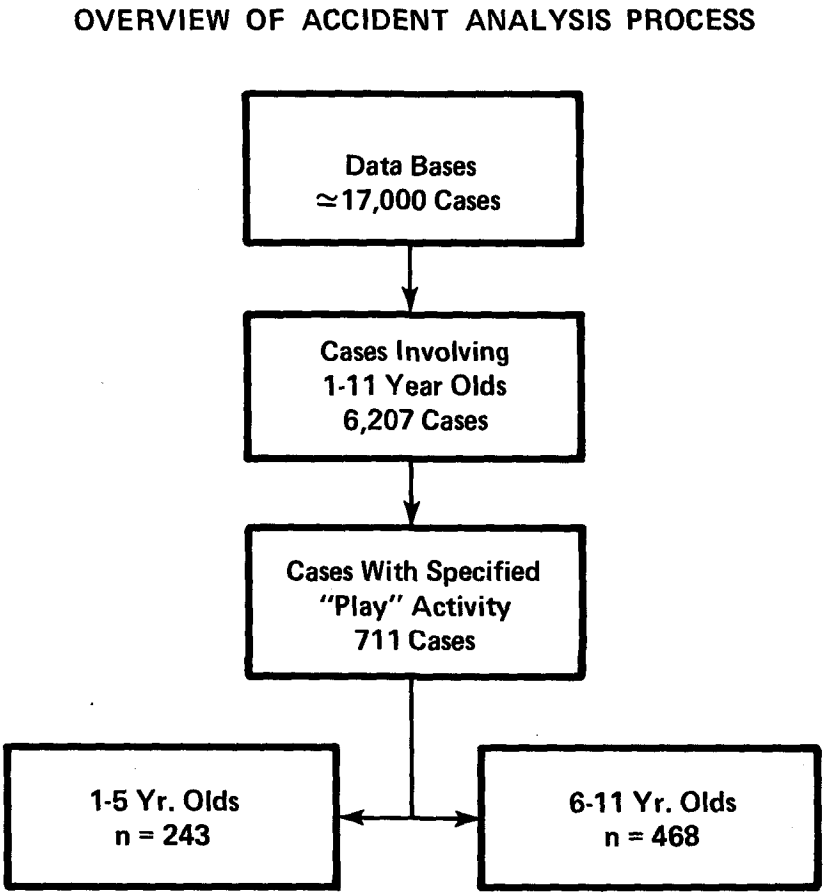


Figure 3-1. Overview of Accident Analysis Process

for each activity. In reviewing this table, it will be noted that, in order to make these two sources of data comparable, certain of the observation-based play activities were collapsed into one accident-based category.

Table 3-2

Accident-Based Activities and the Corresponding Observation-Based Activities for 1-5 Year Olds

Accident-Based Activities	Observation-Based Activities
1. Directed Walking	Directed Walking
2. "Playing" Street Side	Non-Directed Walking Non-Directed Behavior in a Confined Area
3. Running--Directed & Non-Directed	Non-Directed Running Directed Running
4. Retrieving Ball or Object	Kickball Throwing and Catching Ball Throwing Ball and Catching Rebound Football
5. Chasing	Chasing
6. Riding Big Wheel	Riding Big Wheel
7. Riding Tricycle	Riding Tricycle
8. Riding Bicycles/Skateboards Toy Cars, etc.	Riding Bicycle Riding Skateboard
9. Directed Behavior in Confined Area	Directed Behavior in Confined Area

A similar categorization process was applied to the accident data for 6-11 year olds.

Examine Rank Order Correlation Between Accident-Based and Observation-Based Data

Once the street-side accident cases had been categorized by activity, work proceeded on examining the correlation between the accident-based and observation-based activities.

Specifically, the accident-based activities were ranked in terms of prevalence and the corresponding observation-based activities were ranked four ways:

1. Percent observed (vis-a-vis all activities).

2. Percent of ISSEs.

3. Percent of Dart-Out Street Entries.

4. Percent of Street Entry CVCs.

Spearman rank order correlation coefficients (rho) were computed for these sets of ranks. For both age groups (1-5 and 6-11), the highest correlation was found between the ranks for accident frequency and ISSE frequency. Specifically, rho for the rankings of the data for 1-5 year olds was .782 (significant at $p<.05$). For the rankings of the 6-11 year olds data, rho was .81 (significant at $p<.05$).

Specify Preferred Risk Measure for Street-Side Activities

The information presented above indicates a high, statistically significant correlation between accident-based data and the observation-based data for ISSEs. Of the surrogate risk measures under study, ISSEs thus stand out as the preferred measure for estimating the risk associated with the field observation data. Accordingly, for the observation-based data presented in the remainder of this report, ISSEs will be employed as the primary risk measure.

The correspondence between observation and accident data is presented in Figures 3-2, 3-3, and 3-4.

The correlation between accident frequency and Street Entry CVCs was moderate, but not statistically significant. However, given that only 130 Street Entry CVCs were documented, this lack of significance is likely due to the instability of this measure. That is, had a large number (e.g., 300) of Street Entry CVCs been observed, it is likely that the distribution of this measure across activities would have stabilized and reached statistical significance. Therefore, since Street Entry CVCs have obvious face validity--the child came very close to being struck--they will be presented as a supplementary risk measure in the data presented in the next section.

Determine Risk of In-Street Activities

As noted earlier in this subsection, children were frequently observed playing in the street, and a number of In-Street CVCs were documented.

However, since past pedestrian accident typing efforts have not identified an in-street play accident type, the actual riskiness of in-street play has been questioned.

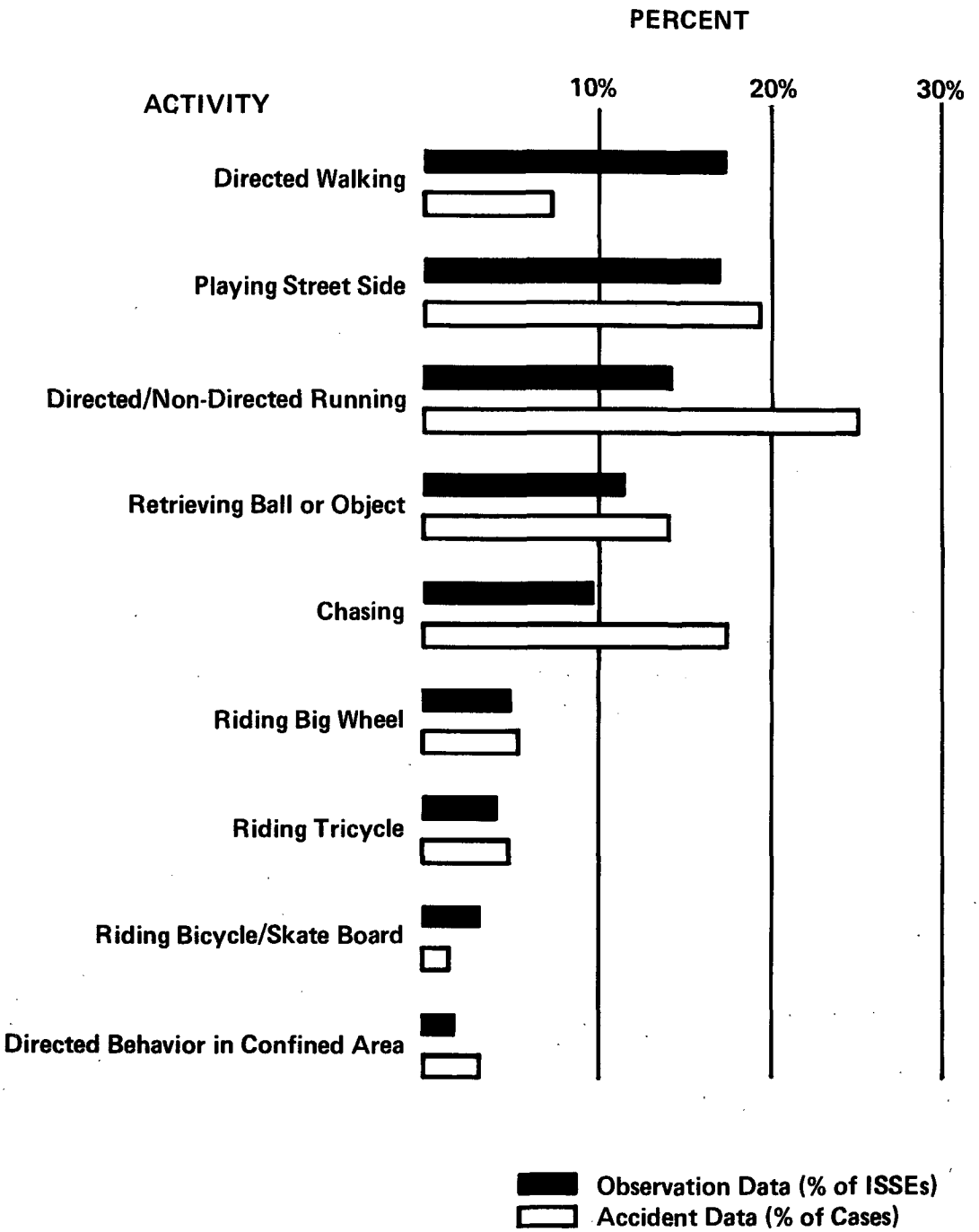


Figure 3-2. Correspondence Between Observation and Accident Data for 1-5 Year Olds

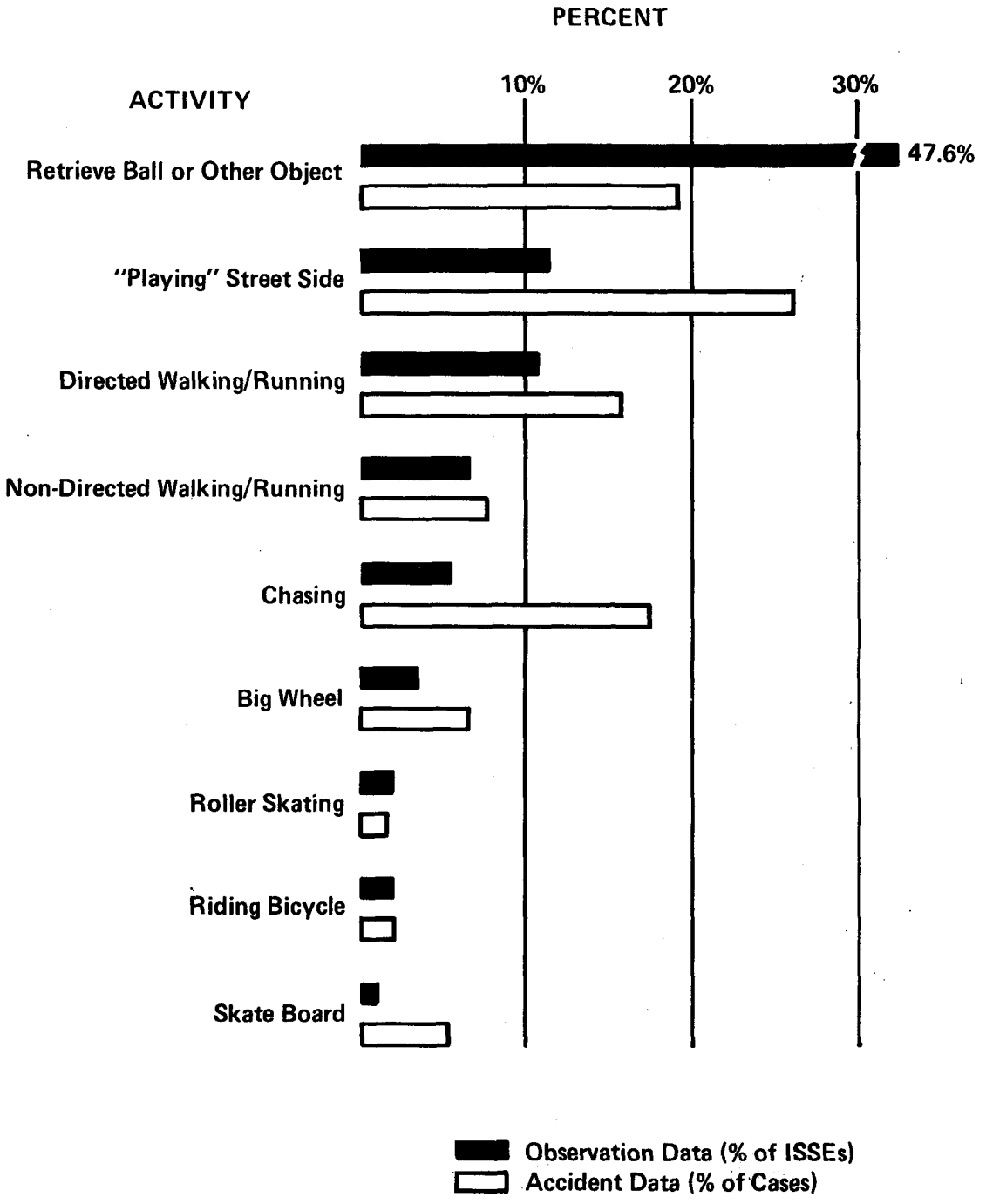


Figure 3-3. Correspondence Between Observation and Accident Data for 6-11 Year Olds

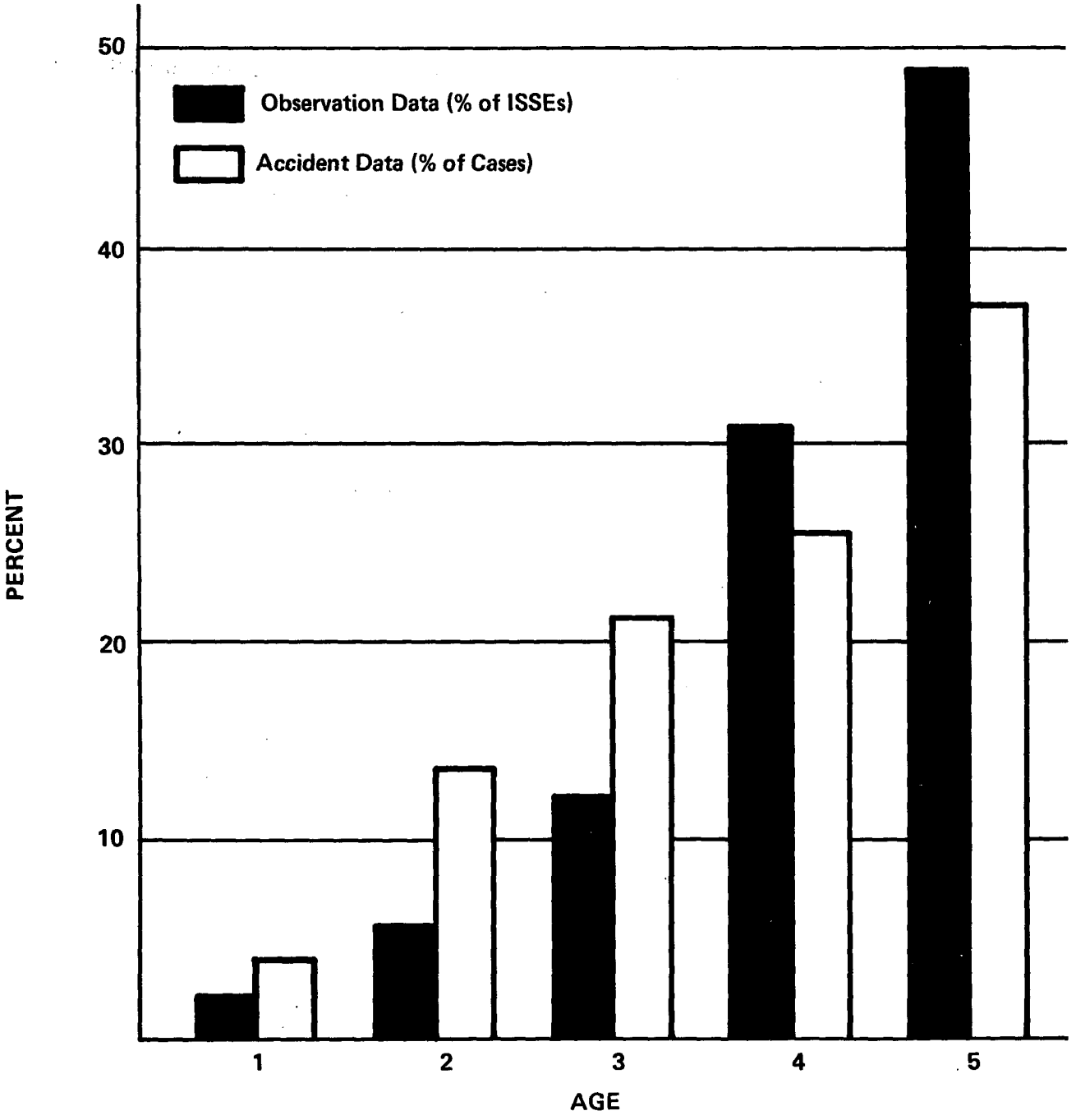


Figure 3-4. Accident Versus Observation - Data by Year Increments

In order to address this question, the accident data referenced above were carefully examined for cases in which the child pedestrian was playing in the street prior to being struck. In most cases, the accident report narrative did not specify the nature of the in-street activity, but simply indicated "playing in street."

Table 3-3 provides a breakdown of these data by age category.

Table 3-3

Accident Frequency by
Pre-Involvement Location

	Age			
	1-5		6-11	
Activity Location	n	Percent	n	Percent
Street Side	208	85.6%	389	83.1%
In Street	35	14.4%	79	16.9%
TOTAL	243	100.0%	468	100.0%

These data reveal, that for 1-5 year olds, 14.4 percent of the accidents involved in-street activity. For 6-11 year olds, the proportion of accidents classified as in-street was 16.9 percent.

These data establish the fact that games or other activities that occur in the street do result in children being struck. These data thus provide indirect validation for the two in-street risk measures employed in the present study:

1. Time observed in-street.

2. In-Street CVCs.

Examination of the In-Street CVC data helps to shed some additional light on how in-street activities can result in children being struck. On initial inspection, In-Street CVCs do not appear truly risky since the element of sudden appearance/short exposure was usually not present. That is, the driver and/or the child should have reacted prior to the occurrence of a conflict. The fact that they did not was a result of one or more of the following factors:

1. The child was attending to the game at hand and did not see the driver bearing down on him until he was only a few car lengths away. The driver in these cases often appeared to be expecting the child to move out of the way and, thus, did not take evasive action (e.g., hard braking, lane change) until a short distance from the child.

2. The child was one of a number of children playing in the street. The majority of children would begin to move out of the vehicle's path (e.g., into the opposite lane) and the driver, seeing that the children had moved, would continue on his course only to come in near conflict with one (or more) children who had not moved with the others (or as quickly as the others).

3. In other cases, the driver and pedestrian simultaneously took the same evasive action (e.g., changed lanes) thus placing them on a collision course.

4. In certain instances, it appeared that both child and driver waited to "give in" until the last second. For example, the driver would sound his horn at some distance from the play group (e.g., 10 car lengths). However, one or more of the children would not heed the warning. Rather than slowing down, the driver would maintain his speed and simply blow the horn more vigorously. The child, daring the driver to take evasive action, would remain in place and a conflict would result.

5. Variations on the above were observed in which either the driver or the child acted in an "aggressive" fashion. That is, certain drivers were observed to speed-up when approaching the play group. While having the effect of "clearing the street," certain children barely got out of the way in time when subjected to this treatment. In other cases, children were observed who deliberately jumped into the path of the car. In these instances, the driver's sudden evasive action (hard braking, swerving) accompanied, in many cases, by threatening gestures/words, seemed to be enjoyed by the children who had caused the near conflict.

In summary, the accident data and the discussion above, serve to validate time observed in street and In-Street CVCs as surrogate risk measures.

Specification of Preferred Risk Measures

The results of accident analyses described in the previous subsections have validated the following as surrogate risk measures:

1. Inadequate Search Street Entries (ISSEs).

2. Street Entry CVCs.

3. In-Street CVCs.

4. Time Observed in Street.

Accordingly, as appropriate, these measures will be used to specify the risk associated with the study findings presented in the next section of the report.

Since accident data were used to validate these measures, one might question why the observation study was necesssary in the first place--why not just look at accident data? This question is addressed below.

Over 14,000 accident cases had to be reviewed in order to find approximately 700 cases where a play activity was indicated on the accident report. Even when play was reported, the level of specificity regarding the activity usually left much to be desired. On the other hand, field data collection provided a wealth of data (e.g., 2,009 ISSEs) that are highly specific with regard to types of activity, play locations, group interactions, etc.

In short, while the accident data has been used to verify the observation data, the observation-based findings could not have been gleaned from an examination of even 100,000 accident reports. As has been well documented elsewhere, accident reports simply do not provide the level of information necessary for basic traffic safety research. While expensive and time consuming, field observation is the only way definitive data regarding subject research variables can be collected.

A Caution Concerning Methodology

One objective of this research study was to identify the streetside play activities of children and to assess them in terms of pedestrian accident risk. To this end, we identified surrogate risk measures (e.g., inadequate search street entries) for selected streetside play activities. These measures permitted a rank ordering of play activities in terms of their behavioral "riskiness" which was then compared to a limited sample of play-related pedestrian accidents. The intent of the effort described in this section was to test the validity of the risk measures by noting the correspondence between activities deemed risky and the occurrence of real accidents involving these activities.

The reader is cautioned about the tentativeness of this validation effort in that the accident sample differed from the behavioral sample in two important aspects. First, the accident locations (i.e., cities examined) overlapped only in part with the sample of cities from which observation data were collected. The project staff was constrained to examine only pedestrian accident data bases that were already in existence. Given the scarcity of accident reports which properly document play activity related accidents, it was deemed best to use data from as large a selection of cities as was available, thus maximizing the sample size. Second, the time frames also differed. The observation data were collected over a period of six months, while the accidents sampled occurred over a period of up to five years prior to the observations. Again, the intention was to maximize sample size by using all available play-related accident cases.

The assumptions underlying these decisions were that play activities do not differ markedly across U.S. cities, nor did they change over the five year time period from which the accident cases derived. Support for the first assumption came from the observations themselves: For the 1-5 age group, which the principal focus of the study, no major differences were found in the distribution of play activities across the five cities in which observations were conducted. For the 6-11 age group, small changes were noted which appeared to be related to the season of the year (i.e., more football activity observed during football season) rather than to the city. We could find no direct support for the second assumption. However, with the possible exception of the skateboard and the "Big Wheel" type play vehicles, all of the play implements used during the observed play activities, and the activities themselves (e.g., kickball, baseball), have been in existence for many years. Thus, there was no apriori reason to suspect that the play activities changed significantly across the time period employed.

A more experimentally rigorous design, which was beyond the scope of the present effort, would involve collecting play observations and accident data in the same cities during the same time period. We believe that additional work of this nature should be performed to further validate the surrogate risk measures developed and employed in this study.

SECTION 4

RESULTS AND CONCLUSIONS

This section presents the major results of the study and conclusions based on these results. While a great deal of data were collected and analyzed, the results presented in this section represent factors that have direct bearing on development of countermeasures. In particular, this section specifies the target groups, high risk activities, and high risk time periods that should be addressed by supervision/guidance countermeasures.

The section is comprised of the following subsections:

1. Overall Characteristics of the Sample.
2. Risk/Prevalence Data by Type of Area.
3. Risk/Prevalence Data for Selected Demographic Factors.
4. Risk/Prevalence Data by Activity.
5. Risk/Prevalence Data by Time of Day and Day of Week.
6. Additional Data Pertinent to Countermeasure Development.

Overall Characteristics of the Sample

In the course of the data collection for the child pedestrian supervision/guidance study, a total of 2,213 children were observed in a variety of street-side/in-the-street play-related situations. The major characteristics of the sample are summarized below:

- 64.4 percent (1,425) of the children observed were 1-5 years old; 35.6 percent (788) were 6-11 years old.
- 23,274 person-minutes of play-related observation were conducted (an average of 10.5 minutes per child observed).
- 792 play sites were observed (an average of 2.8 children per site were subject to continuous observation).
- For 60.2 percent of the person-minutes observed, the subjects were 12 feet or less from the nearest active traffic lane; 31.8 percent of the time they were 12-36 feet away and eight percent of the time they were in an active lane.

- 95 percent of the children who were observed and subsequently interviewed were at a play site within one block of their home.
- 650 of the children observed were subsequently given a full-length interview (66 percent of the children interviewed were 3-5 years old, the remaining 34 percent were 6-11 years old).
- 320 parents (of the children observed) were interviewed. Over 90 percent of these were parents of preschoolers.

Risk/Prevalence Data by Type of Area

As presented in the Sampling Plan, 75 percent of the field observation days were spent in residential areas with High Accident Rates (HARs) for preschoolers, and the remaining 25 percent in areas with Moderate Accident Rates (MARs). This was done to facilitate comparisons of these two types of areas, and to provide some insight into the factors that contribute to the difference in accident rates.

Tables 4-1 and 4-2 present selected risk measures for the two types of areas (HAR and MAR).

Table 4-1

Selected Risk Measures by Type of Area
(High Accident Rate versus Moderate Accident Rate)

Risk Measure	Area				
	HAR		MAR		Totals
	n	Percent	n	Percent*	n
Time Observed (hrs)	310.6	80.1%	77.3	19.9%	387.9
Time In-Street (hrs)	18.1	73.8%	6.4	26.2%	24.5
ISSEs	1525.0	75.9%	484.0	24.1%	2009.0
Street Entry CVCs	105.0	77.7%	30.0	22.3%	135.0
In-Street CVCs	155.0	65.4%	82.0	34.6%	237.0

*Percent of row total.

Table 4-2

Car Lengths for CVCs (In-Street and Street Entry)
by Type of Area*

Car Lengths**	HAR	MAR
1	27.1	12.5
2	43.5	22.3
3	17.1	8.9
4	7.8	39.3
5	4.5	17.0
Total No. of CVCs	260	112

*Table figures are percent of total column CVCs.

**Number of car lengths separation when avoidance reaction occurred.

Examining Table 4-2, we find that in HAR areas the majority (70.6 percent) of the CVCs had a separation factor of two car lengths or less, while in MAR areas, only 34.8 percent of the CVCs had this level of separation. One factor which helps to explain this difference is that the percentage of parked cars (within 10 car lengths of the play site) was found to be much higher in HAR areas: Average of 70 percent in HAR areas versus 40 percent in MAR areas. Parked vehicles near the play site prevent early detection by the child/driver, and thus closer conflicts (CVCs) result.

Examination of the CVC data and the other factors described above provides a good rationale for the differences between HAR and MAR areas. Specifically, these data suggest that HAR areas experience a higher rate of accidents for the following reasons:

1. Street-side parking is much greater in HAR areas and these parked vehicles lead to a greater number of detection failures.

2. Traffic volume in HAR areas was found to be about 50 percent greater than in MAR areas. Thus, the sheer probability of being hit when entering the street is greater in HAR areas.

3. HAR areas were found to have, on the average, four times as many street-side play groups as MAR areas.

Thus, considering factors 1 and 2, above, and, given significantly more children playing street-side in HAR areas, it is not surprising that these areas have a higher rate of child pedestrian accidents.

With the exception of the differences noted above, HAR and MAR areas did not differ substantially in terms of other study variables (e.g., age distribution, games played, presence of supervision/guidance). For this

reason, the data presented in most of the subsequent subsections has been collapsed across areas. Nonetheless, the countermeasure recommendations presented later in the report, do take into account the differences between HAR and MAR areas.

Risk/Prevalence Data for Selected Demographic Factors

This subsection presents risk/prevalence data by age and sex. The age data are arranged in terms of age category: 1-5 year olds and 6-11 year olds. While zero to four years of age is the lower category used in previous research, one to five years of age was seen as a more appropriate category for this particular study, based upon real-world observation. That is, very few children less than one-year old were observed in play situations, and most five-year old children were not in school, as evidenced by the fact that they were frequently seen during the 11:00 a.m. to 3:00 p.m. time frame. Furthermore, analysis of play activity by age data revealed that the five-year olds engaged in activities more closely akin to those of the younger children.

Data for 1-5 Year Olds

Selected risk/prevalence data for 1-5 year olds are presented below by sex and age.

Sex Data. Table 4-3 presents selected risk measures by sex.

Table 4-3

Selected Risk Measures by Sex
(for 1-5 year olds)*

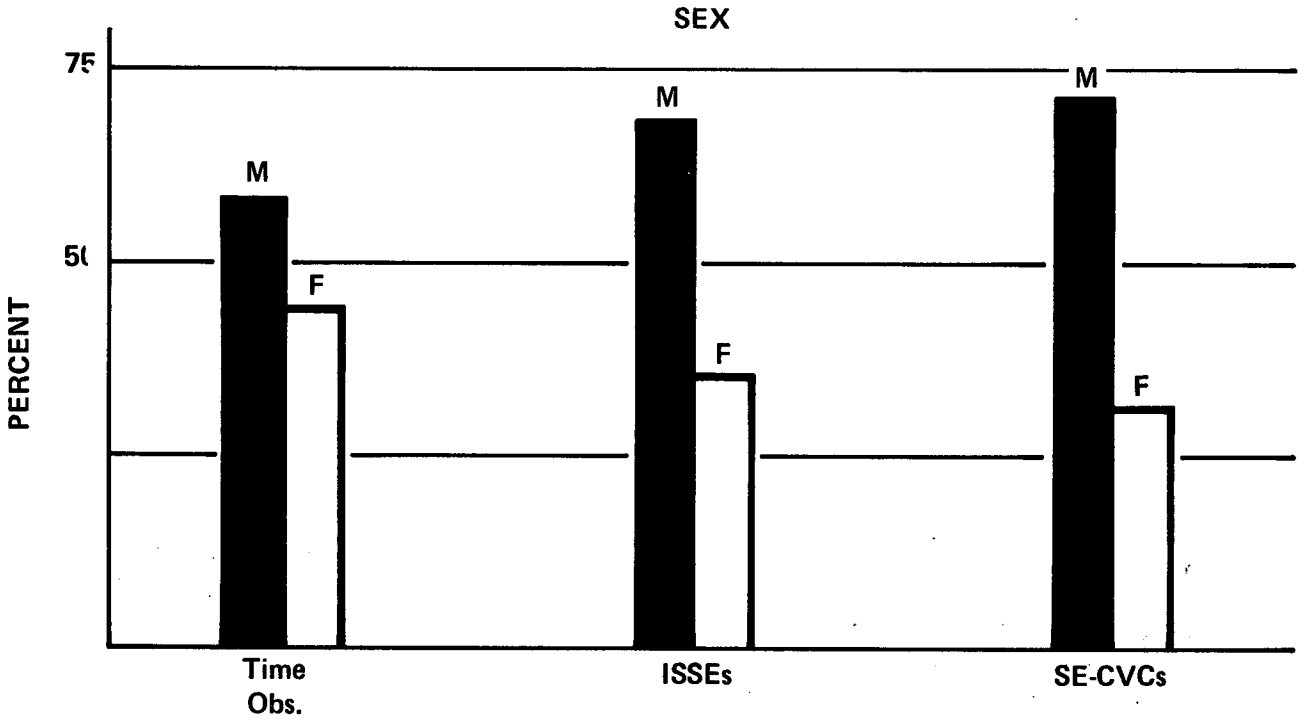
Risk Measure	Sex		
	Male	Female	Total
Time Observed	57.9	42.1	239.3 (hrs)
ISSEs**	67.2	32.8	747.0
SE-CVCs***	70.0	30.0	30.0

*Cells are percent of row total

**Inadequate Search Street Entries

***Street Entry CVCs

Examination of Table 4-3 reveals that males accounted for about 58 percent of the time observed, made 67.2 percent of the ISSEs and were involved in 70 percent of the Street Entry CVCs. This overrepresentation



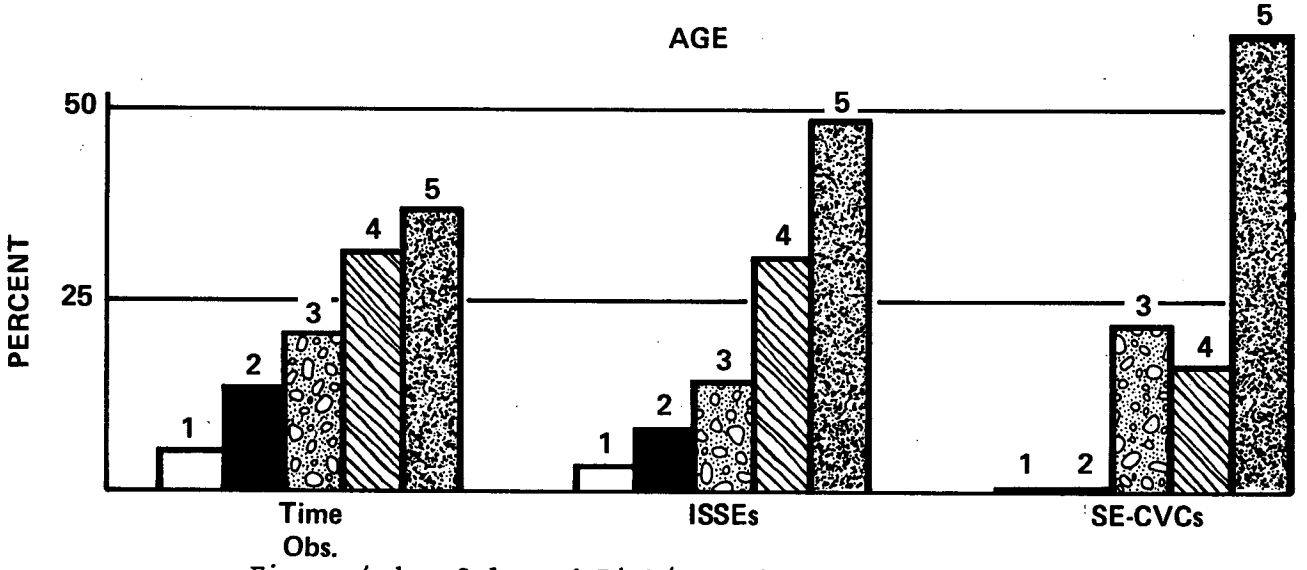


Figure 4-1. Selected Risk/Prevalence Measures by Sex and Age for 1-5 Year Olds

of males in the risk data is consistent with accident data which indicate that bout two-thirds of all accidents for 1-5 year olds involve males. While female preschoolers should not be overlooked, these data clearly indicate that preschool males are the primary target group.

Age Data. Table 4-4 provides a summary of risk measures by age for 1-5 year olds.

Table 4-4

Selected Risk Measures by Age
(for 1-5 year olds)*

Risk Measure	Age 1	2	3	4	5	Total	
Time Observed	2.5	8.6	19.1	32.4	37.2	239.3	(hrs)
ISSEs	1.3	5.4	12.2	31.9	49.1	747.0	
SE-CVCs	0.0	0.0	23.0	17.9	58.9	39.0	

*Cells are percent of row total.

Review of the data presented in Table 4-4 reveals that four and five year olds account for the majority of the time observed and the bulk of the risk measures (i.e., 69.6 percent of the time observed, 81.8 percent of the ISSEs, and 76.8 percent of the Street Entry CVCs). Five year olds appear to be particularly risky, being overrepresented in both the ISSE and CVC data. Three year olds, while only accounting for roughly 20 percent of the measures, nonetheless should be included in the primary target group. As might be expected, one and two year olds were underpresented in terms of risk.

The data summarized above clearly indicates that 3-5 year olds should be the primary target group for countermeasure consideration.

Summary. The data described above, and other cross-tabulations based on both age and sex, indicate that 3-5 year old males constitute the primary target group for the pre-school population. Figure 4-1 presents a summary of the data for 1-5 year olds.

Data for 6-11 Year Olds

Selected risk/prevalence data for 6-11 year olds are presented below by sex and age.

Sex Data. Table 4-5 presents selected risk measures by sex.

Table 4-5

Selected Risk Measures by Sex
(for 6-11 year olds)*

Risk Measure	Sex		
	Male	Female	Total
Time Observed	65.1	34.9	148.6 (hrs)
ISSEs	78.2	21.8	1262.0
SE-CVCs	88.5	11.5	96.0

*Cells are percent of row total

As with the data for 1-5 year olds, but to an even greater extent, these data show males to be overrepresented in the prevalence data and highly overrepresented in the ISSE and CVC data.

This last finding is largely due to a difference in the types of activities engaged in by males versus females of the 6-11 age group. Specifically, the major activities for 1-5 year olds tended to be unisex in nature (e.g., running, riding big wheel). On the other hand, many of the highest risk activities for 6-11 year olds were games largely played by males (e.g., football, kickball, catching ball, etc.).

In summary, the data presented in Table 4-5 indicates that males consitute the overwhelming majority of the risk problem for 6-11 year olds.

Age Data. Table 4-6 presents selected risk measures by age category. The data presented for 6-11 year olds has beeen grouped in terms of the following age categories: 6/7, 8/9 10/11. This was done to streamline presentation of the data, since examination of the risk measures for ungrouped data revealed little differences between the ages in each of these three categories. It should also be noted that 10 and 11 year old children were considered for observation under only a few circumstances. The most typical being a group consisting of one 1-5 year old, one or more 6-9 year olds, and a few children older than nine. In these cases, the observers would first select for observation the youngest children and, if the capability to observe additional children existed, one or more of the children above nine would be observed.

The data presented in Table 4-6 reveals that the majority of the children observed were 6/7 year olds. This is likely a result of our sampling plan bias towards younger children. Nonetheless, data for 8/9 year olds indicates a higher level of involvement in ISSEs and CVCs than would be predicted from the time they were observed. This is primarily a result of the older children being more involved in the games that produced a higher number of ISSEs per time observed (e.g., football).

Table 4-6

Selected Risk Measures by Age
(for 6-11 year olds)*

Risk Measure	Age 6/7	8/9	10/11	Total
Time Observed	64.0	33.0	3.0	148.6 (hrs)
ISSEs	55.7	38.9	5.4	1262.0
SE-CVCs	41.4	53.2	5.4	96.0

*Cells are percent of row total.

Overall, the 6-9 year olds accounted for 97 percent of the time observed, 94.6 percent of the ISSEs, and 94.6 percent of the Street Entry CVCs. These data thus support the need for 6-9 year olds to be subject to the countermeasure approaches described later in this report.

Summary. The data described above, and other cross-tabulations based on both age and sex, indicate that for the school age group 6-9 year old males should be the primary target for countermeasure consideration. Figure 4-2 presents a summary of the data for 6-11 year olds.

Risk/Prevalence Data by Play Activity

This subsection presents risk/prevalence data by play activity for each of the age groups (1-5, 6-11).

Activity Data for 1-5 Year Olds

The activity data for 1-5 year olds is presented in terms of two categories of activity:

1. Street Side Activities. These were activities that occurred near the street (e.g., sidewalk, front yard) but not in the active traffic lanes.

2. In-Street Activities. These were activites that occurred in the active traffic lanes.

Street Side Activities. A total of 26 distinct street-side activities were documented for 1-5 year olds. The 17 major activities in terms of risk/prevalence are defined below. Two figures follow each activity descriptor (e.g., 3.6/17.1). The first is the overall percent of the time

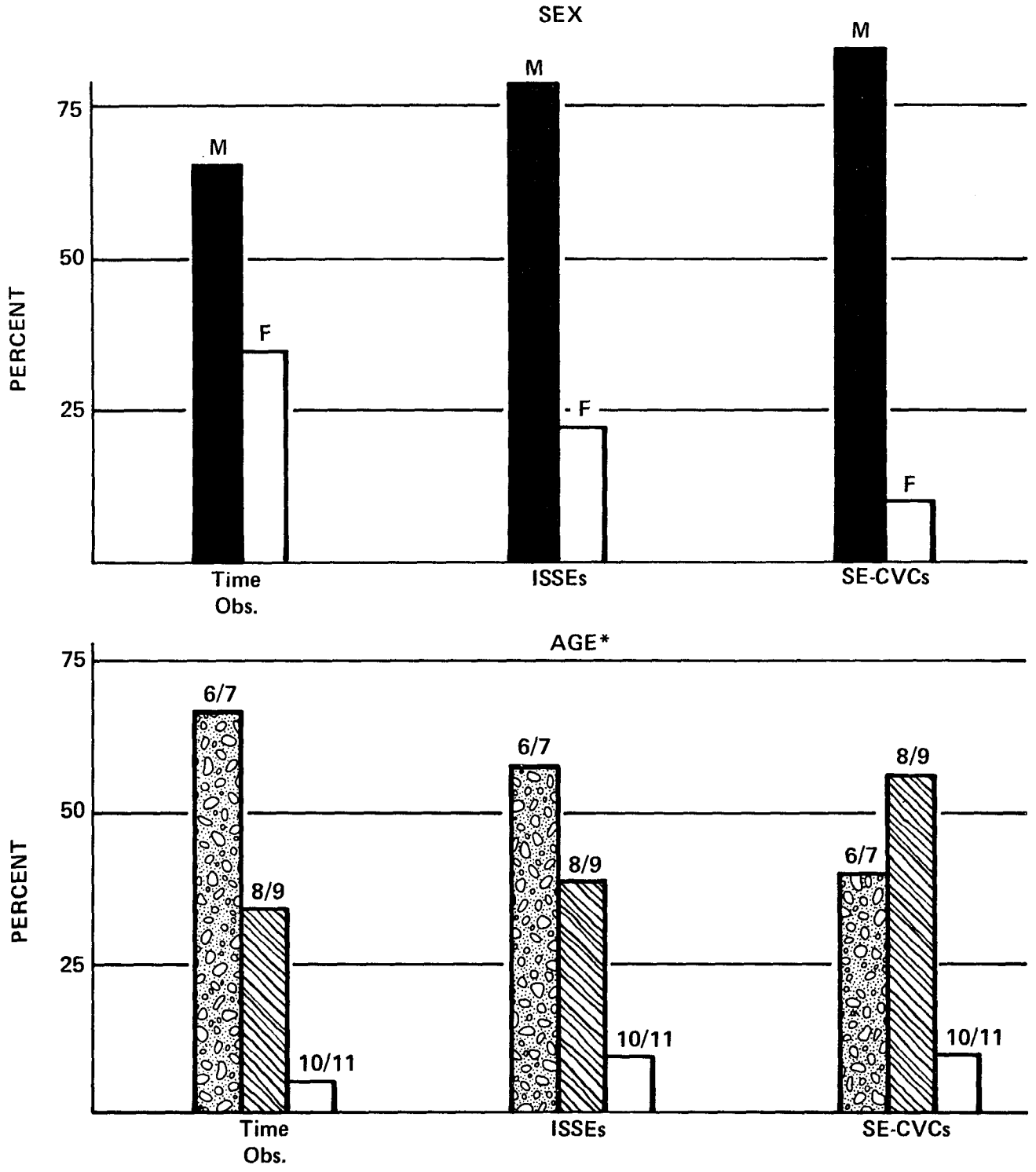


Figure 4-2. Selected Risk/Prevalence Measures by Sex and Age for 6-11 Year Olds

*8-11 year olds underrepresented due to bias in sampling plan towards younger children.

this activity was observed (for 1-5 year olds), the second the percentage of ISSEs accounted for by this activity:

1. Directed Walking (3.6/17.1). This involved one or more children walking, with some destination inferred by the observer, as in crossing a street from a play site to a home.

2. Non-Directed Walking (12.8/12.3). This involved one or more children walking with no destination apparent to the observer. Examples include a child pacing back and forth on the sidewalk, or wandering around unassociated with any game or destination.

3. Non-Directed Running (6.8/11.5). As with non-directed walking, this involved one or more children running with no destination or game involvement apparent to the observer. Included were such activities as darting in and out of the street between parked cars, or running up and down the sidewalk unassociated with any game or destination.

4. Chasing (2.6/9.9). Two or more children, or one or more children and an animal, chasing for the sake of chasing or escaping. This excludes chasing involved with any identifiable game.

5. Riding Big Wheel (7.7/5.1). Riding a tricycle-type toy with a low center of gravity in either a seated or a standing position. (The low center of gravity distinguishes the big wheel in certain important ways which relate to risk; among them the capability of greater speed and decreased visibility.)

6. Throwing and Catching Ball (2.1/4.8). This involved two or more children playing a game which could not be coded as football, basketball, or baseball, with any one of a number of ball sizes.

7. Non-Directed Behavior in a Confined Area (27.3/4.7). This involved basically sedentary activities, without play implements or apparent specific intents. Examples include sitting on front steps, either alone or in a group, or talking with a group of people on the sidewalk.

8. Riding Tricycle (4.5/4.3). Riding a conventional tricycle, in either a seated or a standing position.

9. Kickball (0.5/4.0). In most instances, kickball resembled baseball, with the child's leg replacing the bat and a larger ball replacing the baseball.

10. Directed Running (1.0/2.7). As with directed walking, this involved one or more children running, with some destination inferred by the observer. Directed running was viewed as distinct from running occasioned by participation in some game, such as baseball, and was limited to such activities as running to the corner store or to join a playmate.

11. Throwing Object at Someone (1.0/2.3). This involved such things as throwing snowballs at cars or stones at other children. (Games involving similar actions, such as dodgeball, were coded separately.)

12. Directed Behavior in a Confined Area (15.2/2.0). This also involved basically sedentary activities, but with a play implement (as in pushing toy trucks around a small area of the sidewalk/preboundary area) or a specific intent (as in digging in the dirt).

13. Riding Bicycle (1.6/1.9). Riding a bicycle of any one of a number of sizes, with or without training wheels, in either a seated or a standing position.

14. Throwing Ball and Catching Rebound (0.6/1.6). One or more children throwing any type of resilient object (typically a ball) at a stationary target and attempting to catch the object on the rebound, as in throwing a ball against a brick wall.

15. Flying Kite (0.3/1.3). Directed running limited to that necessary to fly a kite.

16. Football (0.4/0.9). This included not only regulation football (which was seldom seen), but also a number of variations upon the game. Of these, the most common was a combination of passing and then chasing the receiver to some predetermined goal.

17. Riding Skateboard (0.1/0.8). Riding a small board to which roller skate wheels are attached, usually in a standing, but sometimes in a seated, position.

Table 4-7 presents a summary of risk measure data for the above activities. In reviewing these data two factors must be kept in mind:

1. The validity of ISSEs as a surrogate risk measure was well established by the accident analysis activities described in the previous section. Thus, ranking of the activities by proportion of ISSEs accounted for provides the best estimate of the real-world risk associated with each activity.

2. Street Entry CVCs provide a supplemental estimate of risk. However, this is not a highly stable measure,

Table 4-7

Selected Risk Measures by Activity*
1-5 Year Olds

		Percent Observed	Percent ISSE**	Percent Street Entry CVC***
1.	Directed Walking	3.6	17.1	17.9
2.	Non-Directed Walking	12.8	12.3	5.1
3.	Non-Directed Running	6.8	11.5	20.5
4.	Chasing	2.6	9.9	2.6
5.	Riding Big Wheel	7.7	5.1	23.1
6.	Throwing and Catching Ball	2.1	4.8	2.6
7.	Non-Directed Behavior in a Confined Area	27.3	4.7	2.6
8.	Riding Tricycle	4.5	4.3	--
9.	Kickball	0.5	4.0	--
10.	Directed Running	1.0	2.7	--
11.	Throwing Object at Somebody	1.0	2.3	--
12.	Directed Behavior in Confined Area	15.2	2.0	2.6
13.	Riding Bicycle	2.6	1.9	2.6
14.	Throwing Ball and Catching Rebound	0.6	1.6	--
15.	Flying Kite	0.3	1.3	2.6
16.	Football	0.4	0.9	--
17.	Riding Skateboard	0.6	0.8	7.7
	TOTALS	239 hrs.	747	39

*Figures are percent of total column value.

**Inadequate Search Street Entries

***Child-Vehicle Conflicts.

given the relatively low number of Street Entry CVCs observed (n=39) across the number of activities documented. Furthermore, a few activities accounted for a majority of the Street Entry CVCs. While this serves to establish the risk of these activities (e.g., big wheel), it does not imply that other activities which resulted in a high number of ISSEs, but few CVCs are not risky. Had additional observations been conducted, it is likely that conflicts for these activities would have been observed.

Review of the activity data for 1-5 year olds presented in Table 4-7, reveals the following:

- The highest ranked activity was directed walking. Although observed for only 3.6 percent of the time, this activity accounted for over 17 percent of the ISSEs. The top rank of this activity serves to underscore the fact that some preschoolers do not restrict themselves to the area immediately in front of their house. Rather, they were seen traveling to/from a number of destinations within the observation area.

- The next two highest ranked activities (non-directed walking, non-directed running) are not organized games, but rather are the types of unstructured activities in which preschool children are often involved.

- In terms of "structured" activities, big wheel, chasing, kickball, and throwing/catching a ball resulted in a high incidence of risky behaviors. Big wheel is particularly noteworthy since, per time observed, it resulted in a large share of the Street Entry CVCs.

In-Street Activities. Although of relatively low prevalence for 1-5 year olds, certain games were often found to be played in the street. Table 4-8 presents risk/prevalence data for activities which occurred frequently in the street and for which In-Street CVCs were observed.

Per time observed, these activities were found to result in a very high rate of In-Street CVCs. This is particularly so in the case of kickball. These games were usually played in the street because an appropriate alternate play site was simply not available.

Table 4-8

High-Risk In-Street Activities:
1-5 Year Olds*

Activity	(A) Overall Percent Observed	(B) Percent of Observed Time Spent In-Street	(C) Percent of Observations In-Street	(D) Percent of In-Street CVCs
Kickball	0.5	37.5	5.1	48.0
Tennis	0.3	15.7	1.0	16.0
Stickball	0.4	32.2	3.4	12.0
Football	0.4	17.9	1.6	4.0
TOTALS	239 hrs.		8 hrs.	25

*Column totals are for all games observed. With the exception of (B), figures are percent of total column value. Only activities involving In-Street CVCs are listed.

Activity Data for 6-11 Year Olds

The activity data for 6-11 year olds are presented in terms of two categories:

1. Street side activities.

2. In-street activities.

Street Side Activities. A total of 32 different activities were observed for the 6-11 year olds in the sample. Twenty of the activities accounted for close to 95 percent of the ISSEs. Table 4-9 presents the risk measure data for these activities.

Review of the activity data for 6-11 year olds presented in Table 4-9 reveals the following:

- Football was observed for about seven percent of the time, yet resulted in over 20 percent of the ISSEs. However, the percentage of Street Entry CVCs is relatively low. The major reason for this relates to the fact that close to 50 percent of the time football was observed, it was being played in the street. Thus, many of the street entries involved rejoining an in-street group that alerted most drivers to the presence of children and the potential of children darting into the street.

- The data for kickball shows a high rate of risky behaviors, and a high proportion of the Street Entry CVCs.

Table 4-9

Selected Risk Measures by Activity*
6-11 Year Olds

		Percent Observed	Percent ISSE**	Percent Street Entry CVC***
1.	Football	7.7	22.6	4.2
2.	Kickball	6.1	12.9	12.5
3.	Non-Directed Running	7.0	6.4	2.1
4.	Directed Walking	1.7	6.3	5.2
5.	Non-Directed Walking	7.6	6.0	2.1
6.	Chasing	3.2	5.5	2.1
7.	Throwing and Catching Ball	4.5	4.6	12.5
8.	Directed Running	1.0	4.4	1.0
9.	Throwing Object at Somebody	2.8	3.9	14.6
10.	Baseball	2.5	3.6	2.1
11.	Riding Big Wheel	3.4	3.5	1.0
12.	Non-Directed Behavior in a Confined Area	20.7	3.1	4.2
13.	Directed Behavior in a Confined Area	10.9	2.1	8.3
14.	Roller Skating	1.4	1.9	8.3
15.	Riding Bicycle	1.7	1.7	2.1
16.	Flying Kite	0.8	1.1	1.0
17.	Street Hockey	0.4	0.9	8.3
18.	Gymnastics	0.3	0.8	1.0
19.	Jumping Rope	3.0	0.7	--
10.	Tennis	0.5	0.7	--
	TOTALS	120 hrs.	1262	96

*Figures are percent of total column value.

- In contradistinction to the data for the 1-5 year olds, we see that organized/structured activities are among the highest ranked activities (e.g., football, kickball, catch, baseball).

- We still see involvement in unstructured/non-directed activities; however, the level of participation is much lower than for 1-5 year olds. As with the 1-5 year olds, these types of activities generally resulted in a lower rate of risk behaviors (per time observed).

In-Street Activities. As with the 1-5 year olds, but to a much greater extent, certain games were frequently played in the street. Table 4-10 presents risk/prevalence data for activities which occurred frequently in the street and for which In-Street CVCs were observed.

Table 4-10

High Risk In-Street Activities:
6-11 Year Olds*

Activity	(A) Overall Percent Observed	(B) Percent of Observed Time Spent In-Street	(C) Percent of Observations In-Street	(D) Percent of In-Street CVCs
Kickball	7.7	48.2	25.7	66.0
Tennis	2.5	39.2	6.7	11.8
Stickball	6.1	22.8	9.7	9.0
Football	0.5	16.1	0.5	2.8
TOTALS	120 hrs.		17 hrs.	212

*Column totals are for all games observed. With the exception of (B), figures are percent of total column value. Only activities involving In-Street CVCs are listed.

Per time observed, the above four activities resulted in a very high rate of In-Street CVCs. This is particularly so in the case of football.

In addition to the above-mentioned games, our review of play-related accident data for 6-11 year olds revealed other activities that occurred in-street and during which children were struck. These activities, in order of prevalence, are:

- Skateboarding
- Roller Skating
- Riding Big Wheel.

While the above play implements have been around for a number of years, they have recently grown in popularity, or experienced a resurgence of popularity. Thus, although we did not document a high number of in-street cases for these activities during field data collection, recent accident data strongly suggests that they warrant countermeasure attention.

Risk/Prevalence Data by Time of Day and Day of Week

For supervision/guidance countermeasures to be cost effective, it is imperative that they address times of the day and days of the week that are of greatest risk. Data bearing on this issue are presented in this section. These data have been presented by area (HAR versus MAR) since the areas differed substantially in terms of certain measures (e.g., traffic volume). The data are also collapsed across age groups (1-5 and 6-11) since, for most time periods observed, many play groups contained both preschool and young school-age children. Combining the data also gives a truer real world picture of overall risk, and is thus more appropriate for countermeasure considerations.

Figure 4-3 presents, for HAR areas, selected risk measures by time of day for weekdays, Saturday, and Sunday. Figure 4-4 presents the same data for the MAR areas.

Before discussing these figures, it should be noted that the data for the 5:00-7:00 p.m. time frame must be interpreted with one precaution in mind. Specifically, in cities visited during the winter months, we did not observe after 6:00 p.m. due to the early onset of darkness. Therefore, the 5:00-7:00 p.m. data represents 5:00-6:00 p.m. data from all cities, but 6:00-7:00 p.m. data from only three cities. The sample for the 5:00-7:00 p.m. time frame thus contains 25 percent fewer observations (assuming equal opportunities for observation) than the data base for the other three time frames.

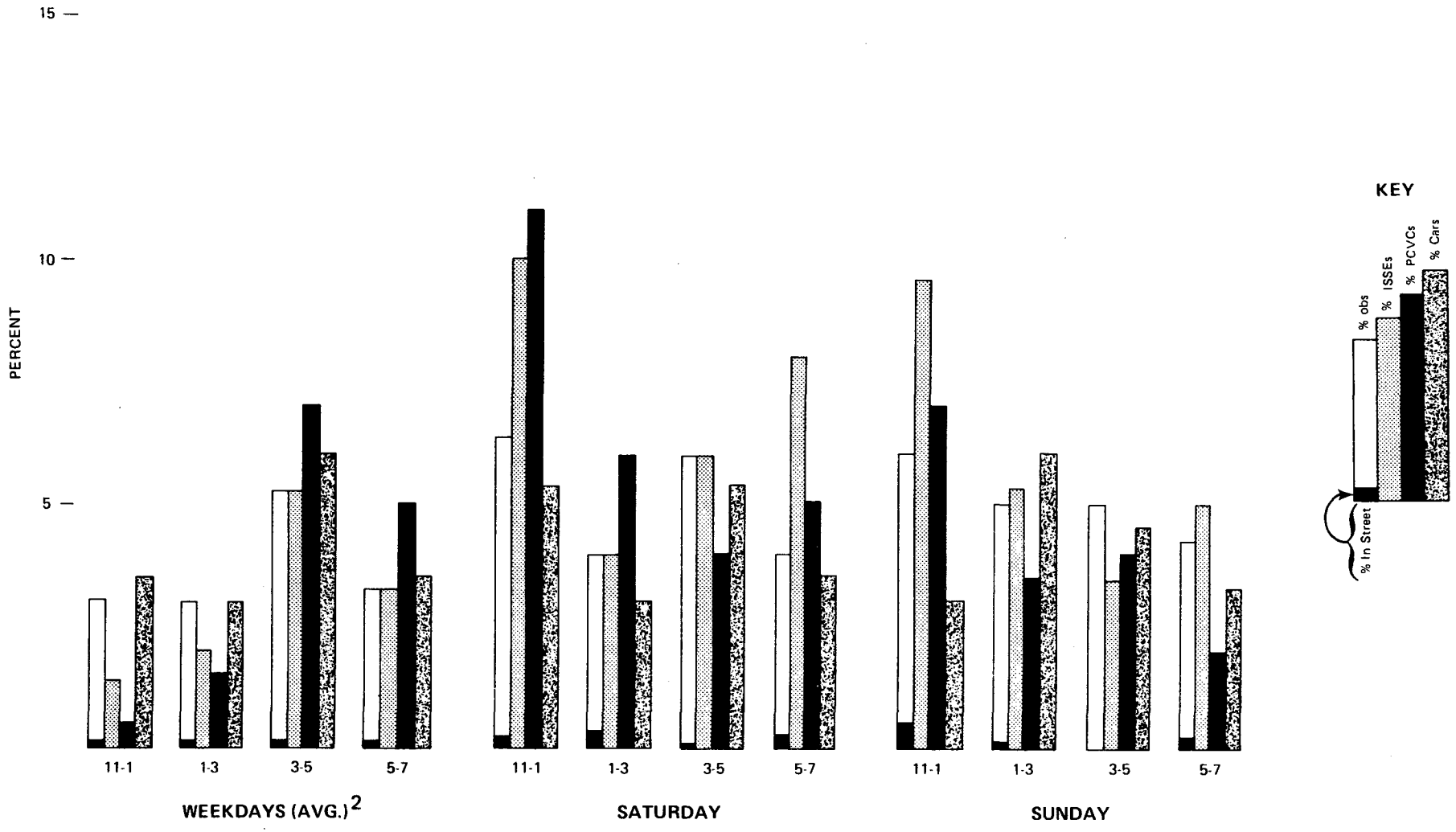
HAR Areas: Weekdays

Examining the data for weekdays in HAR areas (Figure 4-3) we find that:

- The 11:00 a.m.-1:00 p.m. and 1:00-3:00 p.m. time frames are relatively low risk. However, it must be recognized that during these weekday time frames only preschoolers were observed.

- The 3:00-5:00 p.m. time frame is the riskiest in terms of all measures: percent observed, percent of ISSEs, percent of CVCs, and traffic volume (percent of cars).

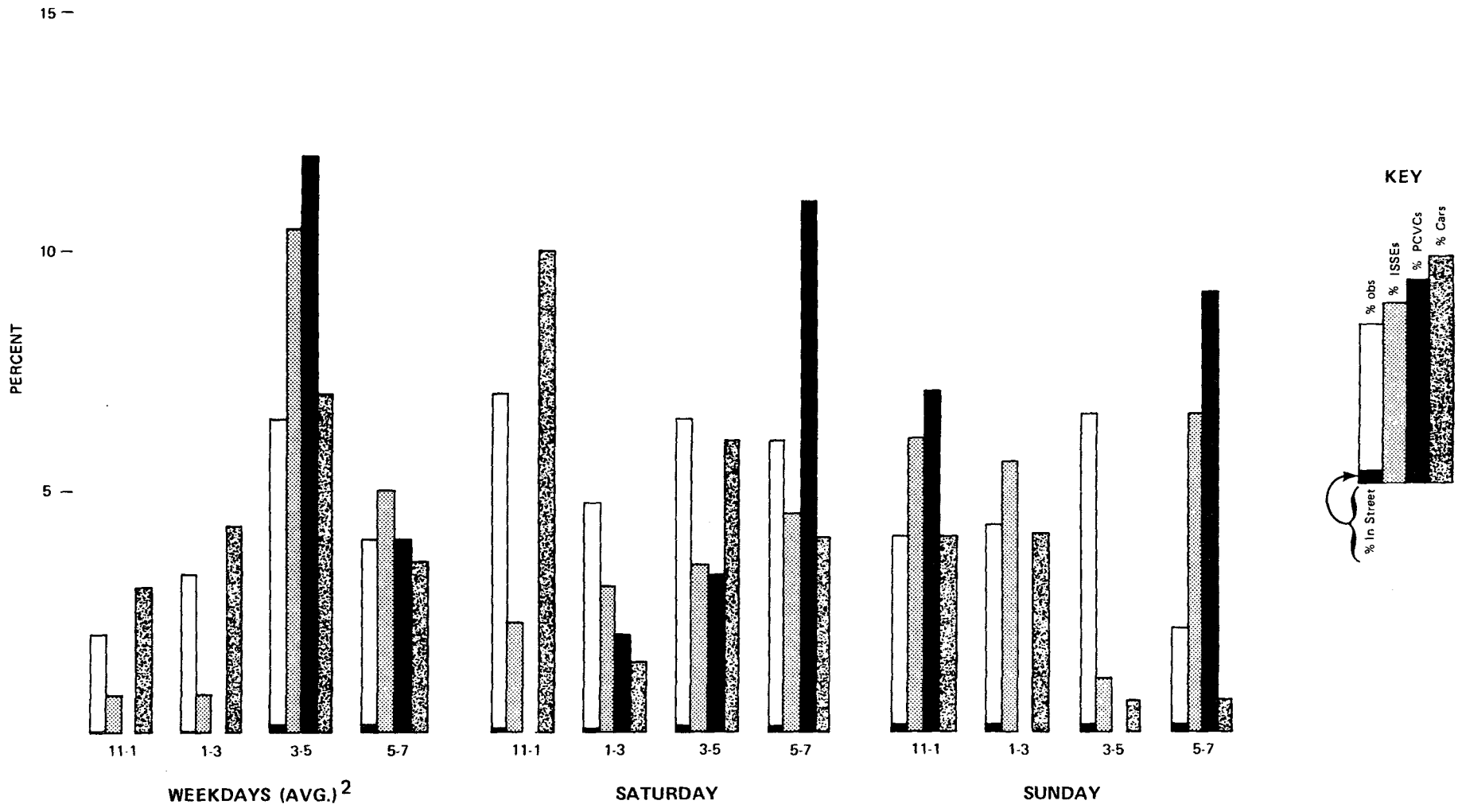
- The 5:00-7:00 p.m. time frame shows the same trends as the 3:00-5:00 p.m. data and, considering the 25 percent



[1]Sample includes all 1-11 year olds.

[2]The data for weekdays were divided by four (observations were not conducted on Tuesday) in order to permit comparison with the Saturday and Sunday data.

Figure 4-3. High Accident Rate Areas: Selected Risk Measures by Time of Day For Weekdays, Saturday, and Sunday[1]



[1]Sample includes all 1-11 year olds.

[2]The data for weekdays were divided by four (observations were not conducted on Tuesday) in order to permit comparison with the Saturday and Sunday data.

Figure 4-4. Moderate Accident Rate Areas: Selected Risk Measures by Time of Day For Weekdays, Saturday, and Sunday[1]

reduction described above, is likely of equal risk to the 3:00-5:00 p.m. time period.

These data suggest the need for some countermeasure attention to preschoolers from 11:00 a.m. to 3:00 p.m., and a major requirement for supervision/guidance of preschoolers and young school age children from 3:00 to 7:00 p.m.

HAR Areas: Saturday/Sunday

Weekends present a different picture since young school age children are home all day and an overall higher level of activity results. The data for Saturday reveal the following:

- The 11:00 a.m.-1:00 p.m. time period is clearly the highest risk period.
- The other periods on Saturday, while showing reduced risk rates, nonetheless display a high incidence of risky behaviors.

Inspection of the data for Sunday reveal:

- A similar, although reduced, peak during the 11:00 a.m.-1:00 p.m. time period.
- Relatively high rates for all risk measures during the remaining three periods. This is particularly true if the 25 percent attentuation factor is considered with respect to the 5:00-7:00 p.m. time frame.

MAR Areas: Weekdays

Examining the data for weekdays in MAR areas (Figure 4-4), we find:

- A significant peak for all risk measures during the 3:00-5:00 p.m. period.
- The same trends, although reduced considerably, during the 5:00-7:00 p.m. time period. Consideration of the 25 percent reduction factor during this period enhances these rates, but does not bring them near the level of the 3:00-5:00 p.m. period.

MAR Areas: Saturday/Sunday

The data for Saturdays in MAR areas reveals that:

- CVCs are notable during the 1:00-3:00 p.m. period and pick up considerably in the remaining periods. While no

CVCs were observed during the 11:00 a.m.-1:00 p.m. time period, we suggest that this period be considered relatively high risk due to the large percent of person-minutes observed, the percent of ISSEs, and very high traffic volume (percent of cars).[6]

Sundays in MAR areas present a mixed picture. Specifically:

- The 11:00 a.m.-1:00 p.m. and 5:00-7:00 p.m. time periods are obviously high risk.
- The 1:00-3:00 p.m. time period shows a high percentage of person-minutes observed, a substantial number of ISSEs, and high traffic volume. For these reasons, even though no CVCs occurred during this period, we judge this period to be relatively high risk.
- The 3:00-5:00 p.m. time period appears very low risk in terms of ISSEs, traffic volume, and CVCs (none).

Summary of Time of Day/ Day of Week Data

The data described above indicates that in HAR areas the critical periods in terms of risk/prevalence are:

- 3:00-7:00 p.m. during weekdays.
- 11:00 a.m.-7:00 p.m. on Saturdays and Sundays.

In MAR areas, the following periods stand out as being particularly risky:

- 3:00-7:00 p.m. during weekdays.
- 11:00 a.m.-7:00 p.m. on Saturdays.
- 11:00 a.m.-3:00 p.m. and 5:00 - 7:00 p.m. on Sundays.

[6] In examining the data for MAR areas, consideration must be given to the fact that the total number of CVCs observed was 112 (versus 260 in HAR areas). Given the relatively low number of CVCs, it is likely that the stability of this measure is compromised when partitioned by time frame and day of week. Thus, the lack of (or low number of) CVCs during certain time frames should not, by itself, be interpreted as indicative of low risk.

Additional Data Pertinent to Countermeasure Development

The previous subsections have provided data concerning target groups, high-risk activities, and high-risk period. This subsection presents data concerning additional variables of importance in developing countermeasures. Specifically, information regarding the following is presented below:

1. Extent and Effects of Observed Supervision.
2. Prevalence and Nature of Parental/Adult Guidance.
3. Type and Number of Alternate Play Sites by Area.

Extent and Effects of Observed Supervision

The extent of observed supervision and its relatiom to ISSEs and CVCs are presented in Figure 4-5.

The data reveal that:

- Children observed playing in a near-the-street setting were without adult supervision close to 80 percent of the time.
- When supervision was present, it appeared to suppress inadequate search street entries and CVCs that sometimes resulted from these entries.

Figure 4-6 presents the extent of supervision and its effects on ISSEs by age category. These data reveal that the extent of observed supervision varied as a function of age. For example, two and three year olds were supervised about 25 percent of the time, while eight and nine year olds had a supervisory agent present for less than seven percent of the time observed. For each age category, it is clear that ISSEs occurred less frequently when supervison was present.

An ex-post facto analysis was performed on the data in order to verify the causal relationship between the presence of supervision and the occurrence of ISSEs and CVCs. To perform the analyses, observations were selected which met the following criteria:

1. Only cases involving children for which supervision was present then absent (or absent then present) were selected. Thus, each child could serve as his/her own control.
2. The above sample of cases was further reduced to include only those children who performed a street entry or were involved in a CVC during the observation period. This additional subdivision was necessary

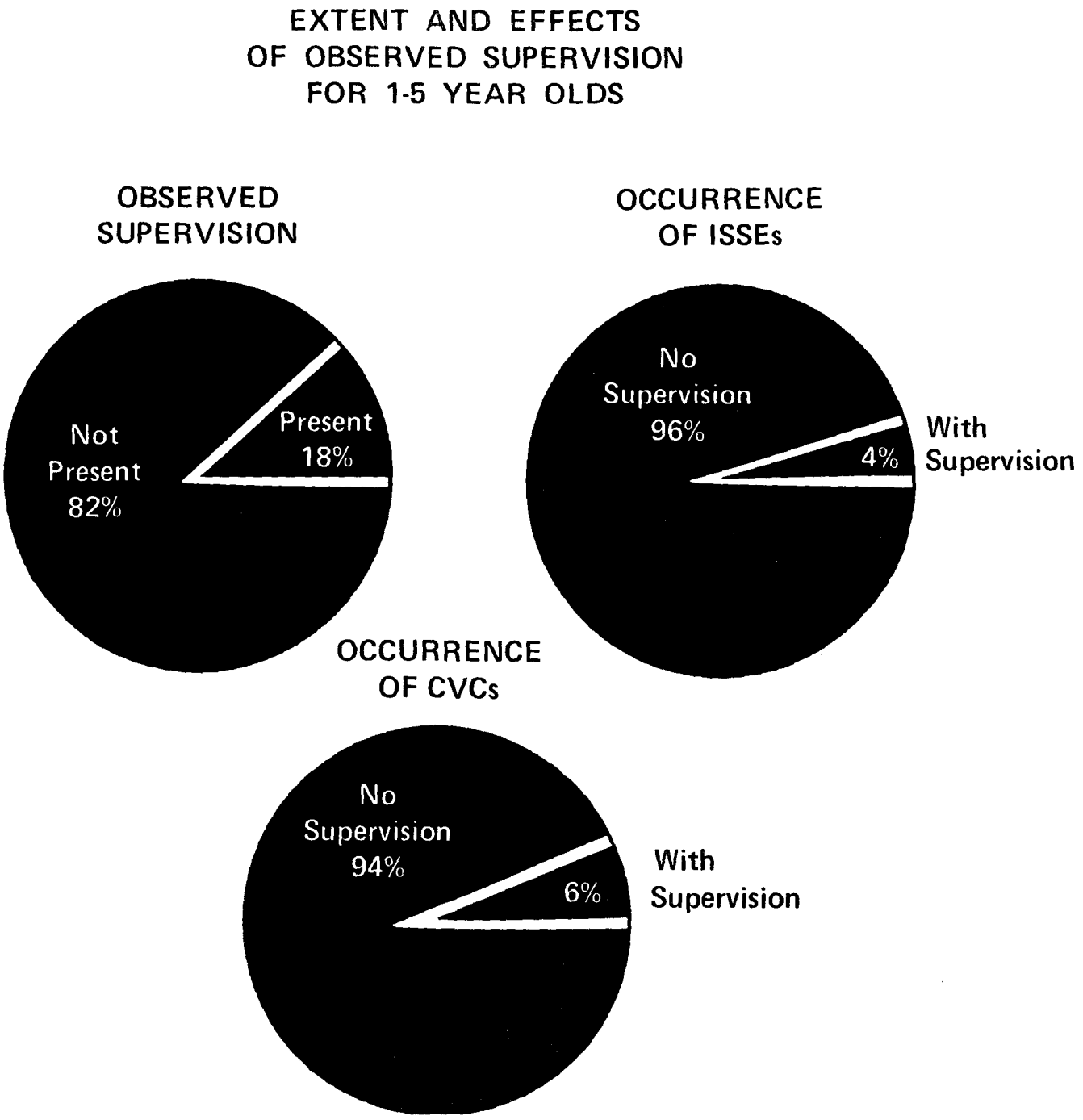


Figure 4-5. Extent and Effects of Observed Supervision for 1-5 Year Olds

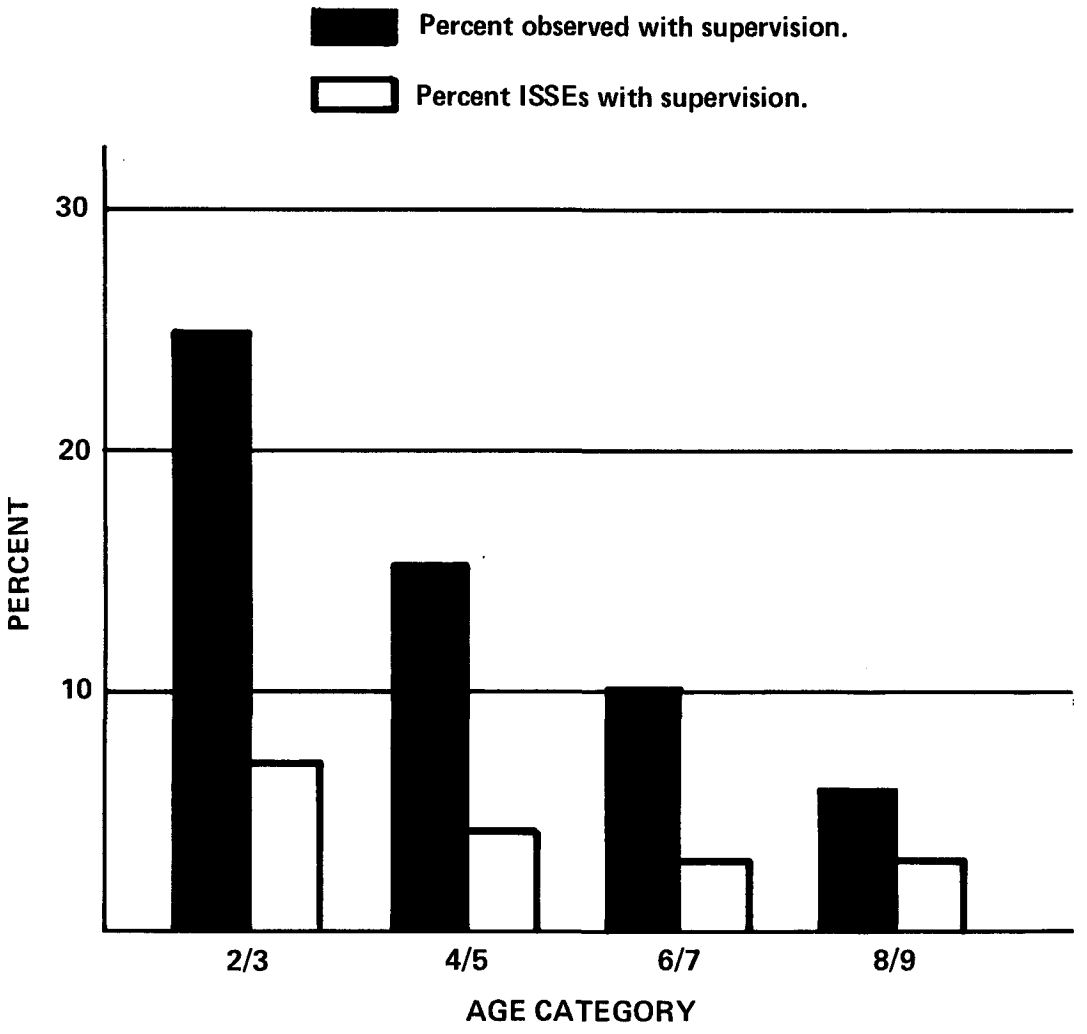


Figure 4-6. Extent and Effects of Supervision by Age Category

since we were looking at the effect of supervision on these dependent measures.

Applying these two criteria to the 2213 children observed, 92 cases were identified. For the cases thus identified, the amount of time in which direct supervision, indirect supervision, and no supervision was present (the definition of "direct" and "indirect" supervision can be found on page 2-18), along with the numer of ISSEs and CVCs for each of these conditions was recorded. These data are presented in Table 4-11. The data clearly show that the majority of the ISSEs (89 percent) occurred when supervision was absent, while the amount of time that the supervision was absent accounted for 77 percent of the observation time. Adjusting the unequal amount of observation time gives an estimate 1.2 ISSEs per 10 minutes of supervised observation time, as compared to 3.0 ISSEs per 10 minutes of unsupervised observation time. Thus, a given child was 2.5 times more likely to perform an ISSE when supervision was absent than when it was present. Indirect and direct supervision appear equally effective in suppressing ISSEs.

Table 4-11

Analyses of the Effects of Supervision

	Total Time Observed	Percent With IS*	Percent With DS**	Percent With None
Overall	1005 min.	12.94%	9.65%	77.41%
Age 1-5	531.5 min.	11.85%	10.07%	78.08%
Age 6-11	473.5 min.	13.30%	11.30%	76.66%
	Total ISSEs	**Percent With IS**	**Percent With DS**	**Percent With None**
Overall	265	5.66%	4.91%	89.43%
Age 1-5	116	5.17%	4.31%	90.52%
Age 6-11	149	6.04%	5.37%	88.59%
	Total CVCs	**Percent With IS**	**Percent With DS**	**Percent With None**
Overall	49	-	-	100%
Age 1-5	17	-	-	100%
Age 6-11	32	-	-	100%

*IS = Indirect Supervision

**DS = Direct Supervision

The data on the CVCs is even more straightforward. While 49 CVCs were observed when supervision was absent (.6 PCVCs per 10 minutes unsupervised) no CVCs were noted during the 227 minutes of supervised observation time. This finding indicates that, while a child is not likely to enter the

street while being supervised, he/she is even less likely to enter the street when a vehicle is approaching if supervision is present.

A chi-square analysis of the data for ISSEs reveals that the differences described above are significant at the .01 level for both age groups, 1-5 and 6-11. (Chi-square = 11.23 and 12.52, respectively, df = 1).

The above results certainly support the effectiveness of organized supervisory activities as countermeasures to play-related child pedestrian accidents. Furthermore, the results of parent interviews indicated a willingness on the part of adults in the neighborhood to provide the required supervision. Specifically, the parent interviews[7] revealed the following:

- 70 percent of parents said they would supervise local children on rotating basis.
- 79 percent of parents said they would approve of another adult supervising their child--only 10 percent specifically disapproved of this idea.
- 67 percent of the parents felt that blocking the street during certain hours of the day to make it a "play street" would be an effective safety measure.

Prevalence and Nature of Parental/Adult Guidance

While parental guidance was occasionally documented in the observational data, the best source of information concerning this variable is in the child interview data. Specifically, analysis of the child interview data revealed that:[8]

- Less than 20 percent of the children reported receiving street safety guidance on a regular basis (e.g., weekly).
- When given, guidance was usually global in nature and tended to focus on what the child should not do, e.g., "stay out of the street."
- Few children had received detailed guidance regarding proper street safety behaviors.

[7] Based on interviews with 288 parents of 1-5 year olds that had been observed.

[8] Based on interviews with 424 1-5 year olds (mainly 3-5 year olds).

These results underscore the need for more frequent, positively focused guidance from parents and/or other adult agents (e.g., how to search before crossing street).

Alternate Play Sites

One of the data items collected at each play observation site was the presence or absence of alternate play sites within one block of the site, and the type, if such existed. These data are shown in Table 4-12, which presents type and number of alternate play sites by area, and a number of important facts impacting upon countermeasure considerations.

The table shows that 44.3 percent of the play observation sites in HAR areas had no first alternate play site (i.e., no alternate play sites), and that 84.0 percent had no second alternate (i.e., had one type of alternate site, but not a second). In MAR areas, the figures are 29.3 percent and 79.0 percent, respectively. In HAR areas, 32.8 percent of the sites did have medium to large yards as an alternate play site (as opposed to 51.0 percent at MAR sites).

A possible countermeasure appropriate in both types of area is the improvement of vacant lots (8.5 percent of the HAR areas and 5.0 percent of the MAR areas had vacant lots). In many cases, these vacant lots are presently rubble-strewn or unsafe for other reasons, but might easily and cheaply be made available for safe play. This is particularly true in the densely populated core areas of large cities, where the vacant lots have the added advantage of being within walking distance of area children.

Table 4-12

Type and Number of Alternate Play Sites by Area*

Type of Site	1st Alternate Play Site		2nd Alternate Play Site	
	Area		Area	
	HAR	MAR	HAR	MAR
None	44.3	29.3	84.0	79.0
Medium-Large Yard(s)**	32.8	51.0	2.9	9.0
Vacant Lot	8.5	5.0	2.2	1.0
Parking Lot	6.1	10.2	1.6	0.0
Fenced in Playground/Park	1.1	1.2	2.2	1.2
Fenced in Medium-Large Yard(s)	2.6	1.8	6.1	3.0
Playground/Park	1.1	1.2	1.0	1.8
Large Vacant Area at End of Dead End Street	1.0	0.0	0.3	0.0
Alley/Lane***	0.2	0.0	0.0	5.4
Total Observed Sites	(626)	(166)	(626)	(166)

*Figures are percent of total column observation sites.

**Yards at least 15 feet deep. Average depth = 25 feet.

***Used mainly by residents and with very low traffic volume.

SECTION 5

COUNTERMEASURE RECOMMENDATIONS

The results discussed in the previous section were the foundation on which supervision/guidance countermeasures are defined. The development of the countermeasure ideas, however, was also guided by the child and parent interview data. Nine countermeasure ideas were defined but, in the process of countermeasure definition, it became apparent that most communities probably lacked an effective mechanism for implementing them. This led to the development of an implementation model.

This section of the report is organized into the following sub-sections:

1. Factors Effecting the Specification of Countermeasures.
2. Description of the Recommended Supervision/Guidance Countermeasures.
3. Countermeasure Selection/Implementation Model.

Factors Affecting the Specification of Countermeasures

The evaluation of the observation and interview data led to the specification of several factors or objectives which guided the development of the countermeasure ideas. These are as follows:

1. Only supervision/guidance countermeasures were to be developed.
2. Countermeasures were to be tailored for preschool and early school-age children.
3. Countermeasures should act to increase the frequency of occurrence of safe play-related behaviors.
4. Countermeasures should be implemented on the neighborhood level, making maximum use of volunteer personnel.
5. Countermeasures should impact high-risk play activities.
6. Countermeasures should focus on high-risk time periods.

Each of these factors is discussed separately below.

Only Supervision/Guidance Countermeasures to be Developed

The original objective of the study was to develop supervision/guidance countermeasures, and the study data supported this decision. That is:

- Children observed playing in a near-the-street setting were without adult supervision close to 80 percent of the time observed.
- Only about 20 percent of the children reported that guidance was provided on a regular basis (e.g., at least once a week). The remaining 80 percent could not recall specific instances of guidance and/or had been provided safety-related instructions at very irregular intervals.
- When supervision was present, it appeared to suppress inadequate search street entries and the CVCs that sometimes resulted from these entries.

Other countermeasure approaches were clearly less appropriate. Regulations, enforcement, and public information campaigns cannot directly affect the behavior of young children. These techniques may be directed at parents in the hope of indirectly affecting their children's behavior, but the outcomes are likely to be poor relative to direct approaches. Traffic engineering changes are not feasible because the accidents are not specific to given locations and potential modifications of the environment (e.g., barricades, large-scale parking restrictions) would be too expensive or unpopular to implement. Training is a possible countermeasure approach, but training alone is not feasible because, unlike school-aged children, the preschoolers are not typically assembled in groups wherein training could be conducted. Training, together with other countermeasure features, was deemed appropriate for consideration.

Countermeasures Tailored for Preschool and Early School-Aged Children

A major study objective was to define countermeasures to combat pedestrian accidents among preschoolers. However, previous research[9] has shown that early school-aged children are at far higher risk. The present study indicated that:

- The 6-11 year olds constituted only 34 percent of the time observed, yet accounted for 66 percent of the risk behaviors (ISSEs and CVCs).

[9] Synder, et. al, 1971.

- Younger and older children commonly play together, especially during the after-school hours.

These facts imply that, while the major countermeasure emphasis *must* be on preschoolers, the early school-aged children should not--and probably cannot--be excused from consideration. Males should be emphasized, since they are involved in over two-thirds of the high risk behaviors.

Countermeasures to Increase Occurrence of Safe Play Behaviors

The child interviews indicate that the nature of guidance, when given by parents, tended to focus on what the child should not do (e.g., stay out of the street); few children had received positive instruction on what they should do to avoid being hit by cars (e.g., look both ways before crossing, play only at certain safe locations, play football only when an adult is present). These data strongly suggest that children should be provided guidance (training) concerning the following:

- Games that are to be played only when an adult is present (e.g., ones involving balls, big wheels, skateboard riding).
- Location of safe play areas for games that are particularly risky.
- How to modify the play of the games to make them less risky.
- Safe street crossing behaviors--proper search/detection behaviors (e.g., anti-dart-out type of training).

Countermeasures Implemented on the Neighborood Level and Maximizing Use of Volunteer Personnel

The study results document the fact that neighborhoods differ greatly in their safety-relevant physical characteristics (e.g., traffic density, degree of on-street parking, availability of alternate play sites), as well as the organizational and other resources they can muster to help prevent their child pedestrian accidents. Thus, countermeasures must be matched to the specific needs of the neighborhoods. Supervision/guidance countermeasures require heavy person-hour commitments if they are to be successful and, therefore, heavy reliance on volunteer help is the only way to make the countermeasures cost-feasible. The interview findings support the neighborhood implemntation concept:

- Over 95 percent of the children were observed at a play site within one block of their home (or the house of a relative/friend with whom they were visiting).

- Close to 80 percent of the children indicated that they would not mind someone other than their parents/siblings/ friends watching them when engaged in street-side play.

- With respect to instructions regarding where to play, 81 percent of the children said they would listen; concerning what games not to play, close to 70 percent gave a positive answer.

- Two-thirds of the parents indicated that they would be willing to supervise local children on a rotating basis; less than 10 percent of the parents specifically indicated that they would disapprove of some other adult supervising their child. The majority approved of this idea.

- With respect to the effectiveness of supervision by other agents, the parent interviews revealed the following:

Percent Who Thought Agent Would Be Effective	Agent
72.1	School Crossing Guards
67.5	Church/Community Service Volunteers
58.4	Teenagers

Countermeasures Should Impact High Risk Play Activities

For the 1-5 year olds, the results of risk/prevalence analyses revealed that the following street-side activities should receive primary attention (activities are ranked from highest risk to moderate risk).

- Directed Walking
- Non-Directed Walking
- Non-Directed Running
- Chasing
- Big Wheel
- Throwing and Catching Ball
- Riding Tricycle
- Kickball
- Directed Running
- Throwing Object at Somebody

Countermeasures should also address the following activities that were often played in the street and which, as a group, were involved in all of the observed In-Street CVCs:

- Kickball
- Tennis
- Stickball
- Football

The high risk street-side activities for 6-9 year olds are:

- Football
- Kickball
- Non-Directed Running
- Non-Directed Walking
- Chasing
- Throwing and Catching Ball
- Directed running
- Throwing Object at Somebody
- Baseball
- Riding Big Wheel
- Roller Skating
- Riding Bicycle

In addition to the above activities, analysis of the observation data and recent accident data indicate the need for countermeasures to address the following activities which 6-11 year olds frequently played in the street:

- Football
- Baseball
- Kickball
- Tennis
- Skateboarding
- Roller Skating
- Riding Big Wheel

Countermeasures to Focus on High Risk Time Periods

Supervision approaches should concentrate on times/days shown to be high risk. The study data indicates that the most critical periods are:

- 3:00-7:00 p.m. on weekdays.
- 11:00 a.m.-7:00 p.m. on weekends.

Description of the Recommended Supervision/Guidance Countermeasures

The study results clearly indicate that the basic purposes of the supervision/guidance countermeasures must be to:

1. Reduce the occurrence of unsafe street entries through direct action on the child and/or the play environment each time he/she is observed to be playing near the street.
2. Change the probabilities that the child will enter the street in an unsafe manner in present and in future play near the street.
3. Reduce the extent to which children use the street as a playground for in-street activities.

Research in child development, particularly the work of Piaget[10] and Sandels,[11] indicates that it is relatively difficult to train young children to reliably enter the street safely. Children are basically egocentric at this preoperational level in their development and do not comprehend the danger associated with moving traffic and the need to take actions to detect and avoid it. For this reason, the primary aim of countermeasures for this age group must be to prevent street entry by direct action on the part of supervision/guidance agents.

Most four and five year olds can, of course, be trained, given many iterations of a properly designed training paradigm. Since it is unlikely that a supervision/guidance agent will always be on hand when a situation arises which leads the child to enter the street, it is important to initiate training of these older preschoolers so that they will learn to behave appropriately in the absence of the agent. The direct action approach will have immediate impact on the preschoolers' accidents while training will have a delayed effect (i.e., reducing accidents among the older children who have been exposed to training for several months).

It is important to differentiate supervision/guidance countermeasures into two parts. First, countermeasure actions must be defined. These are the specific actions taken by the supervision/guidance agent upon the target children. The other component of the countermeasure is the delivery system (i.e., the identification of the agent and the specific mechanism which enables the actions).

Countermeasure Actions

The basic question to be answered in defining countermeasure actions is, given that a supervision/guidance agent observes a child playing near the street (or in the street), what must the agent do to prevent a street entry (or in-street conflict)? As discussed above, both direct actions and training can be considered as countermeasure actions.

In order to identify direct actions, each of the play activity types, as defined earlier in this report, were examined to identify circumstances under which the ISSEs typically occurred. Then the characteristics of each activity were examined to identify ways of intervening in the activity to prevent the occurrence of ISSEs or In-Street CVCs. Five direct actions were identified which could be used to impact all or some of the activities. These actions are:

---

[10] Piaget, J. The child's conception of movement and speed. New York: Basic Books, Inc., 1979.

[11] Sandels, S. Young children in traffic. British Journal of Educational Psychology, 1979, 40 (2).

1. Stay with the child. This action involves direct or indirect supervision of street-side play groups. The designated agent is present when the child is playing near the street so that he/she can physically restrain the child attempting to enter the street, or at least warn the child. This action will work for all the play activities identified in the study and represents the most effective method of preventing ISSEs. It is often not feasible to stay with the child at all times while he/she is at play near the street.

2. Move the play site. The site of the play activity may be moved to a point further from the street. Given that alternate sites are available, that site would be chosen which minimizes the likelihood of a street entry or which provides a satisfactory alternative for in-street games (e.g., football). Alternate sites may not be available which fit the requirements of the play activity. Where alternate sites are not nearby, parent cooperation will be required, and arrangements must be made to get the child safely to and from the site.

3. Modify the game or rules of the game. Certain of the play activities involve games or, if not games in the formal sense, at least activities which involve rules which structure how they are carried out. The rules for games and structured activities may be modified so as to reduce the likelihood of street entry. For example, stepping into the street as part of a chasing activity can be ruled an "automatic out." The positioning of players in a ball game can be changed to make the ball less likely to enter the street. In cases where the play of the game cannot be easily modified to make it safer, the child or children would be encouraged to play a different game and shown the rules of the new game, if necesary.

4. Remove play implements. Where certain activities cannot be made safer by other means, parents will be asked to withhold the play implements used for these activities until a supervision/guidance agent is available to watch the child. Balls and big wheel type toys are examples of play implements used in high risk activities.

5. Delimit boundaries. When other aspects of the play situation cannot be changed, one action that can be taken is to delimit the child's play area so that the street is specifically excluded. The interview data indicate that about half the children report being told by their parents not to enter the street, yet many of these same children were observed committing ISSEs or playing in the street. Thus, delimiting play areas by verbal instructions not to enter the street will likely

be ineffective. Instead, the boundaries of the play area would be marked by highly distinctive and discernible stimuli (e.g., brightly colored signs placed at the child's eye level on posts and stakes. Such signs would be placed, for example, at the curb between parked cars).

The outcome of this process is summarized, by age group (1-5 and 6-11 year olds), as an actions-by-activities matrix in Tables 5-1 and 5-2.

In addition to taking one or more of the above actions to reduce the likelihood of street entry where children are observed playing near the street, the supervision/guidance agent will also provide training. Historically, two philosophies have been followed in pedestrian safety training with children:

1. Risk avoidance (i.e., training the children to avoid street entries). The rationale for this philosophy is that children are not capable of searching for, detecting, and making the safe-to-cross judgments necessary to assure their safety. Thus, they should be taught the simpler street avoidance behaviors.

2. Risk handling. This philosophy asserts that children should be taught how to search for, detect, and properly react to threatening traffic.

The optimal approach in the training of the target group children should involve a combination of approaches. Younger children (i.e., through age three) would be taught to avoid the street. Because simpler rules and discriminations are involved, this approach will have a greater likelihood of success with these children. Also, risk avoidance will have greater parent support.

Previous research[12] has demonstrated that children five years old and older can be taught a simple stop-search-detect-wait sequence. Thus, the older preschoolers and the early school-aged child can be trained in risk handling. The data reviewed in earlier sections show that these children are most heavily involved in both ISSEs and accidents. They tend to free range more in their neighborhoods and tend to be more involved in activities which increase the likelihood street entries. Training risk avoidance (e.g., "don't go in the street") in this group conflicts with these tendencies, and it is probably for this reason that such training has been ineffective with these children. Instead, as outlined above, training in risk handling is required.

[12] Dueker, R. L. Experimental field test of proposed anti-dart-out training programs. Valencia, PA: Applied Science Associates, Inc., December 1980.

Activity	Stay w/ Child	Move Play Site	Modify Game/ Rules	Remove Play Implement	Delimit Boundaries
Directed Walking	X	X			X
Non-Directed Walking	X	X			X
Non-Directed Running	X	X			X
Chasing	X	X			X
Riding Big Wheel	X	X*		X	X
Throwing and Catching Ball	X	X	X	X	X
Non-Directed Behavior in a Confined Area	X	X			X
Riding Tricycle	X	X*		X	X
Kickball	X	X	X	X	X
Directed Running	X	X			X
Throwing Object at Somebody	X	X		X	X
Directed Behavior in a Confined Area	X	X			X
Riding Bicycle	X	X*		X	X
Throwing Ball and Catching Rebound	X	X	X	X	X
Flying Kite	X	X	X	X	X
Riding Skateboard	X	X*		X	X

*Because riding these vehicles requires a smooth surface in many play situations, other less risky sites away from the street may not be available in some neighborhoods.

Table 5-1. Countermeasure Actions by Play Activities Matrix for 1-5 Year Olds

Activity	Stay w/ Child	Move Play Site	Modify Game/ Rules	Remove Play Implement	Delimit Boundaries
Football	X	X	X	X	X
Kickball	X	X		X	X
Non-Directed Running	X	X			X
Directed Walking	X	X			X
Non-Directed Walking	X	X			X
Chasing	X	X			X
Throwing Ball and Catching Rebound	X	X	X	X	X
Directed Running	X	X			X
Throwing Object at Somebody	X	X			X
Baseball	X	X	X	X	X
Riding Big Wheel	X	X*		X	X
Non-Directed Behavior in a Confined Area	X	X			X
Directed Behavior in a Confined Area	X	X			X
Roller Skating	X	X*		X	X
Riding Bicycle	X	X*		X	X
Flying Kite	X	X		X	X
Street Hockey	X	X		X	X
Gymnastics	X	X			X
Jumping Rope	X	X		X	X
Tennis	X	X	X	X	X

*Because riding these vehicles requires a smooth surface in many play situations, other less risky sites away from the street may not be available in some neighborhoods.

Table 5-2. Countermeasure Actions by Play Activities Matrix for 6-11 Year Olds

For the risk avoidance groups, the supervision/guidance agent would:

1. Explain that cars hurt children if they hit them.

2. Explain that drivers often can't see children and can't stop in time to avoid hitting them.

3. Frequently reiterate where the child's play boundaries are and that he/she must not enter the street.

4. Reward occurrences where the child is observed to avoid street entry and correct (i.e., demonstrate what the child should have done) cases where the child is seen entering the street.

For the risk handling groups, the agent will, with parent permission:

1. Reiterate the dangers associated with street entry.

2. Demonstrate the correct behaviors when entering the street.

3. Supervise the child while he/she practices safe street entry, providing reinforcement and corrective feedback as appropriate. This practice will emphasize street entry as part of the activities the child often engages in (e.g., retrieving a ball, crossing to/from a friend's house).

Even though the emphasis for older children will be on risk handling, certain types of street entry will be systematically discouraged. Specifically, this will apply to street entries while riding toy vehicles--big wheel type vehicles, tricycles, bicycles, roller skates, and skateboards. Training would involve frequent reiterations of the dangers associated with such entries, demonstrations of these dangers, and demonstration of alternate safe riding practices and reinforcement of correct practices.

Delivery Mechanisms

Thus far, the discussion of countermeasures has centered upon the activities of the supervision/guidance agent as he/she interacts with target group children at play near the street. To completely specify a supervision/guidance countermeasure, it is also necessary to describe the mechanisms that cause the agent to be at the play site, as well as to specify who is the agent. The development of delivery mechanisms is based on the premise that, in many neighborhoods, parents, by themselves, cannot provide sufficient supervision and guidance to safeguard their children, although they are, the most obvious supervision/guidance agent. Children usually want to play outside and, in many neighborhoods, convenient away-from-the-street play areas are simply not available. Parents usually have competing time demands (e.g., household tasks, care of other children) which prevent them from keeping a full-time watch while their children play near the street.

Accordingly, alternate mechanisms, including the parent as a possible agent, were defined to permit the application of the direct actions and training. Two general strategies were followed in specifying the mechanisms. The first was to define arrangements whereby other responsible persons in the neighborhood could act as supervision/guidance agents. The second was to create alternate play sites with supervision/guidance agents present. In all, nine countermeasure delivery mechanisms were defined. These are summarized in Table 5-3 in terms of the direct actions each would emphasize. Each of the delivery mechanisms is described in the subsections to follow.

	COUNTERMEASURE ACTION				
Delivery Mechanism	Stay w/ Child	Move Play Site	Modify Game/ Rules	Remove Play Implement	Delimit Boundaries
Parent Agents	X	X	X	X	X
Neighborhood Patrol	X	X	X	X	X
Block Agents	X	X	X	X	X
Older Brother/Sister Patrol	X	X	X	X	X
Play Streets	X	X			
Alternate Play Sites	X	X			
Local Playgrounds/Parks	X	X			
Parking Lane Play Areas	X	X			
Remote Playgrounds/Parks	X	X			

Table 5-3. Countermeasure Action by Delivery Mechanism Matrix

Parent Agents

An obviously important delivery mechanism involves the parent as the agent. The mechanism would work by providing parents with a systematic course of instruction for training their children in safe street-side habits. The self-taught course would provide easy step-by-step instructions for the parent to follow in reinforcing the following behaviors in his/her child:

1. Always staying within play areas (as prescribed by the parent) away from the street. Training would also be designed to prevent the directed walking activities

where the destination of the walking carries the child into the street.[13]

2. Playing activities with a low probability of street entry (e.g., activities involving directed behavior in a confined area like playing with small toy cars or with dolls), and avoiding those with high probability (e.g., chasing and ball throwing activities), unless the parent is present to provide direct supervision.

3. Coming immediately and quickly when called. This habit will permit the child to be promptly called out of the street should he/she go into it for any reason.

Volunteers would be employed to distribute the program materials to parents of preschoolers in their neighborhoods. The volunteers would answer questions concerning the program and assist parents in applying it.

The process of conducting the training would involve the parent as a supervision agent, with heavy participation initially and then tapering off as the child learns the appropriate behaviors.

The program would also provide the parent with information concerning:

1. Which activities most often lead to street entries.

2. How to control the child's activities by limiting his/her choice of play implements.

3. How to lead the child to perceive that he/she is being watched even when he/she isn't.

4. How to "time share" watching the child with other household activities so that the child's activities can be effectively tracked.

Neighborhood Patrol

This countermeasure would involve trained volunteers who would patrol high accident frequency residential areas. Each volunteer would be assigned a given area (e.g., 3-4 blocks square) to walk during periods of

[13] Directed Walking accounted for the largest proportion of inadequate search street entries and child-vehicle conflicts of all preschooler activities identified.

high street-side (or in-street) play activity. He/she would provide guidance to the children regarding:

1. Alternate play sites.

2. Play activity modification to reduce the likelihood of street entry (e.g., changing the rules of the game to avoid entries).

3. Alternate (i.e., safer) games.

4. General safety guidance (e.g., reminders to stop and search before entering the street).

Volunteers for the patrol would come from at least the following groups:

1. Teenagers--recruited either through their parents or high schools.

2. Retired or disabled persons.

3. Parents.

4. Crossing guards (in their off-duty times).

5. Policeman (operating as part of their regular patrol and/or community service duties).

Ideally, volunteers from several sources would be involved in a given neighborhood.

Block Agents

For this countermeasure, a responsible person (i.e., teenager, parent, or other available adult) would be assigned to provide supervision/guidance during defined periods of each day on the block where he/she lives. "Block" may be defined as a single city block, the street segment in front of the person's home (i.e., the street between adjacent intersections), two adjacent street segments, or otherwise as required by neighborhood conditions. In any case, the "block" is an area configured such that the block agent can simultaneously observe all children under his/her supervision. Parents on the block would be encouraged to permit their child to play street-side only during those hours when the block agent is on duty.

The block agent would provide guidance as specified under the neighborhood patrol approach, and he/she would also provide direct supervision of the children.

Older Brother/Sister Agents

The observation data clearly shows that, after school and on weekends, a large proportion of play groups involve both preschoolers and their older school-aged brothers and sisters. Further, it is often the case that parents depend upon the older children to look after the preschoolers. This countermeasure would involve a training program conducted in the public elementary schools for grades three through six.[14] The course would involve about 3-4 hours of time in 10-15 minute blocks. There would be heavy initial emphasis (e.g., sessions every other day), and reminder/reinforcement sessions throughout the school year. The training would have a heavy audiovisual emphasis, minimizing teacher preparation requirements. It would:

1. Encourage/reinforce the child for looking out for younger children who are playing near the street.

2. Develop the student's ability to discriminate safe and unsafe play areas.

3. Demonstrate why some play implements (e.g., balls and riding toys) are more risky than others from the standpoint of causing street entry.

4. Demonstrate the rules of safe play near the street.

5. Show the importance of setting a good example for younger children.

As part of the course, parents' materials would be developed so that parents could coordinate with and reinforce the material learned in class.

Play Street

The play street countermeasure would entail blocking a street segment to through traffic on specified hours/days of each week. The area served by the play street would be sufficiently small that preschoolers could easily walk to it without crossing any street which was not protected by a crossing guard. One possible configuration would be to locate the play street in the center of a six-block square as shown in Figure 5-1.

The play street would be staffed by a minimum of two volunteers from the area served. They would be responsible for:

1. Erecting the barricades and removing/storing them at the appropriate times.

---

[14] Training modules would also be developed for junior/senior high school students as well. These modules could be designed to fit within the "life skills" curriculum which is becoming increasingly more popular in secondary education.

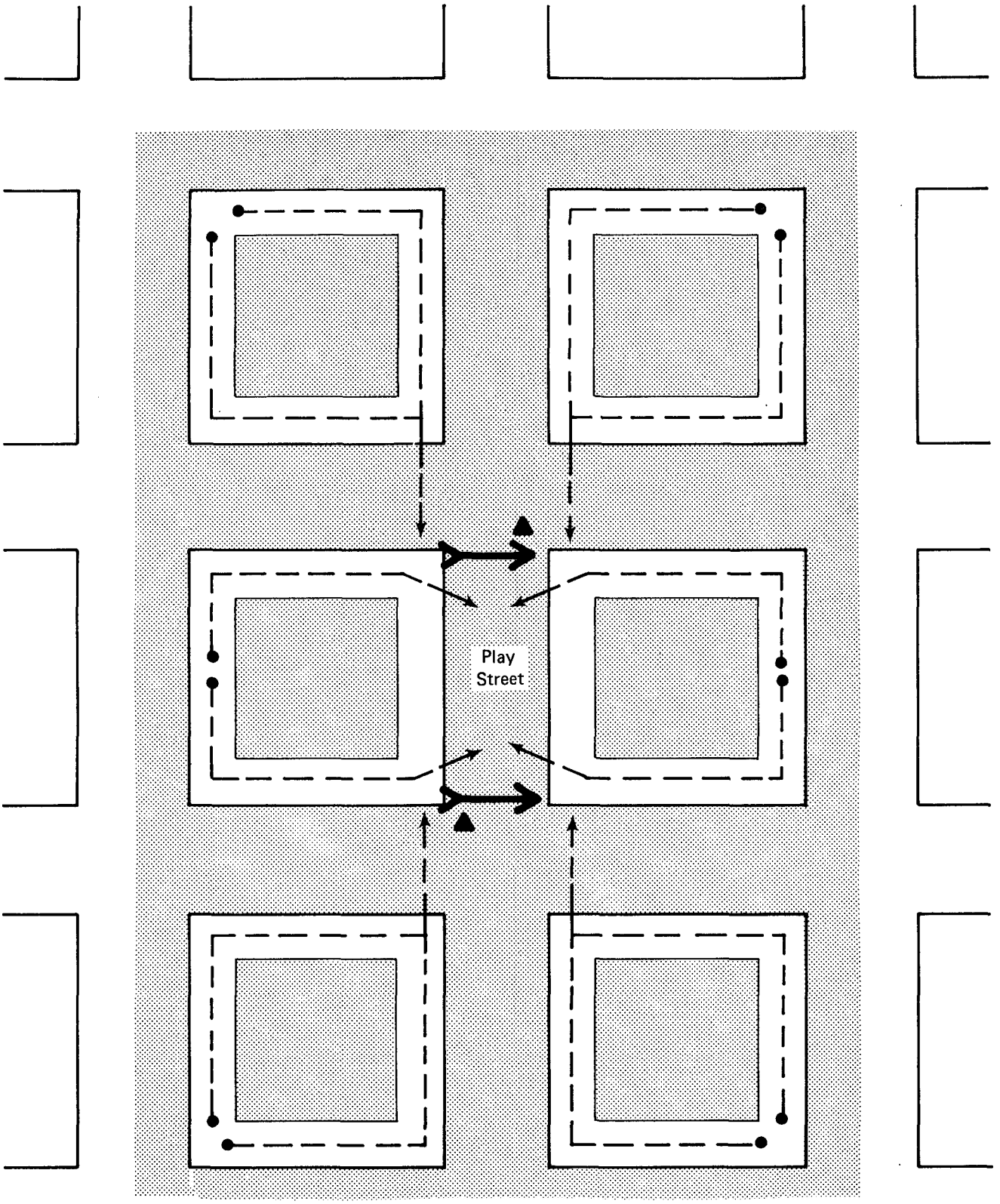


Figure 5-1. One Possible Configuration for a Play Street to Serve Six City Blocks

2. Helping the children cross the street at the intersections at either end of the play street.

3. Controlling local traffic entering/leaving the play street. (Parking on the play street during hours of operation would be banned, if possible.)

4. Maintaining order and assuring that the children remain within the play street boundaries.

Additional volunteers would be required to act as crossing guards where children must cross streets other than at the barricades in order to reach the play street.

Parents in the area served would be informed regarding the schedule of operations of their play street and would be requested to escort young children (e.g., three year olds) to and from the play streets area.

All children using the street would have their addresses and telephone numbers logged so that their parents could be contacted if necessary. Telephone and rest room facilities would be provided.

The foregoing represents the minimum characteristics of the play street. Where additional volunteer help is available, recreation activities would be planned for the children (e.g., games, contests, story telling, songfests) and inexpensive play equipment provided.

Alternate Play Sites

This countermeasure involves the use of off-street areas which were not originally intended as play areas. Such areas include vacant lots, large yards of private residences or apartment/office buildings, and little-used parking areas (including specially blocked off areas of large parking lots). As with the play streets, these sites must be easily reached by preschoolers in the area served.

Volunteers would be utilized to:

1. Identify suitable sites.

2. Obtain permission to use the sites.

3. Prepare sites for use, including clean-up and general "safety-proofing" of the sites (e.g., filling holes, removing rocks, placing barricades).

4. Maintaining the sites (e.g., removing debris and cutting grass).

Parents would be informed concerning the availability of the sites and encouraged to have their children use them.

Alternate play sites would generally be available to the children at all times, but volunteer help would supervise the sites during the high use periods for preschoolers. Volunteer crossing guards might be provided at prespecified times to assist children in crossing streets enroute to a site, thus extending the area served by the site.

Local Playgrounds/Parks

Of course, where a park or playground is within easy walking distance it can also be employed. As with the Alternate Play Site Approach, Volunteers would prepare a specific area for use by the children and maintain the area. A major concern here is to provide an area where the young children can play without conflict with or interference from the activities of older children and adults who are also using the facility. Volunteers can also act as crossing guards where streets must be crossed to reach the play area.

Parking Lane Play Areas

With this mechanism, the curb lane of a designated street segment would be blocked to provide extra area for the children. A parking lane play area could be employed on a two-way street, three lanes or more wide; or a one-way street, two or more lanes wide. Figure 5-2 illustrates three possible configurations.

Certain important features of the parking lane play area concept can be seen in the figure:

1. The lane nearest the curb is blocked off as the play area, although on four-lane streets two lanes might be blocked, depending on local conditions.

2. Parking is banned at least on the side to be blocked, however, depending upon street width, parking may have to be banned on both sides. These bans, of course, would be limited to the days the play area is in use.

3. Vehicles are parked at both ends of the play area to provide extra protection for the children and to discourage vehicles from moving into the play area lane(s) as they proceed down the street.

Remote Playground/Parks

The previous countermeasure mechanisms have involved activities which are performed within a given neighborhood to provide safe play for the preschoolers. All have involved provision of supervision and/or guidance within easy walking distance of the child's home. Where it is not feasible due to local restraints to employ any of the previous approaches, or where additional supervision/guidance capability is required, it may be advisable

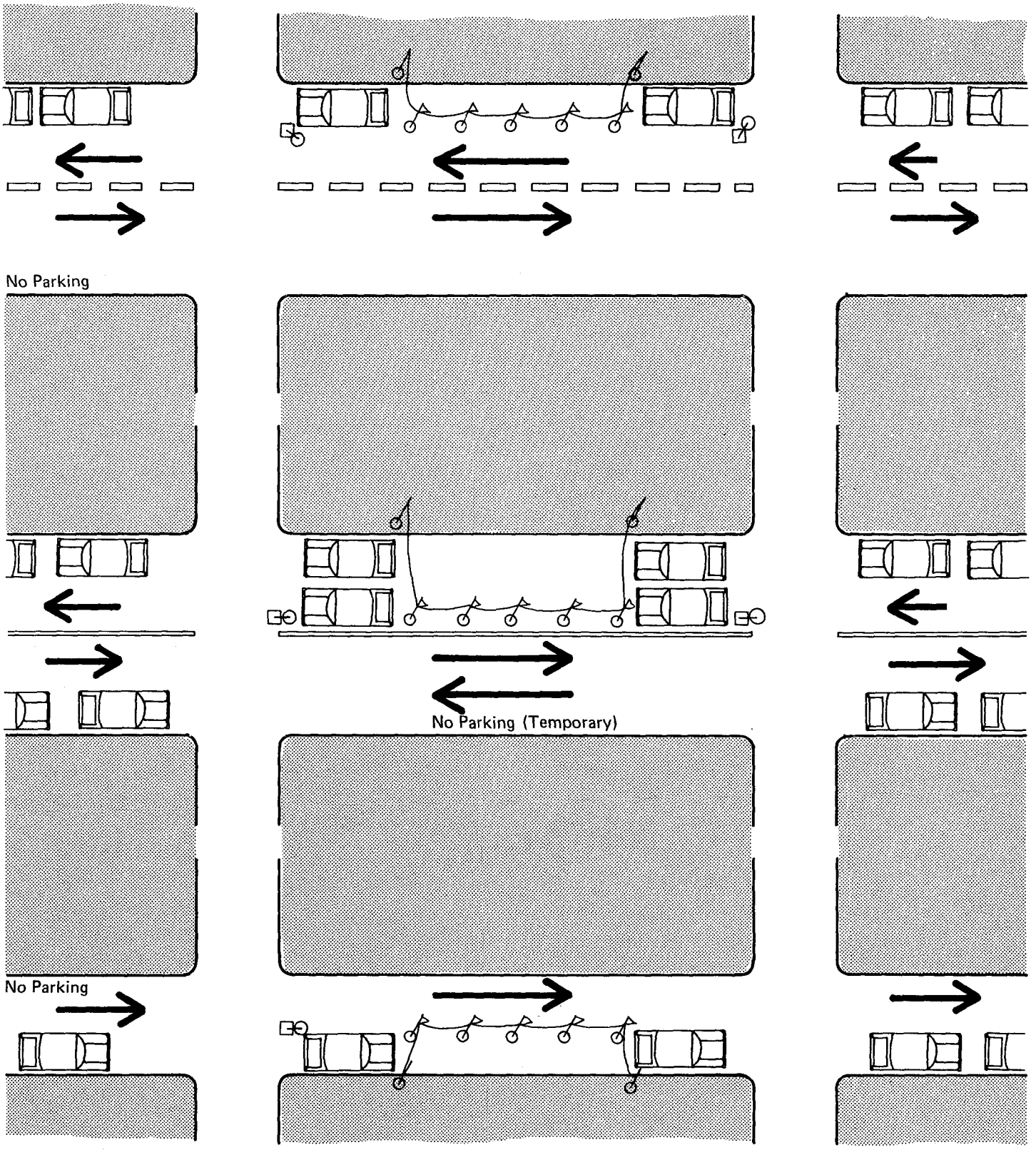


Figure 5-2. Three Possible Applications of a Parking Lane Play Area

to transport preschoolers outside of their immediate neighborhood to safe play areas.

As with other mechanisms, the transporting of children would be organized within a neighborhood. Volunteers would be responsible for:

1. Identifying an appropriate play location which is as close as possible to the neighborhood. This play location would likely be a park or playground.

2. Arranging for the use of the play area and preparing the area (e.g., blocking it off, if required). These arrangements would be similar to those required for the Alternate Play Sites Approach.

3. Arranging for and scheduling the transportation.

4. Providing supervision at the play area.

5. Informing neighborhood parents concerning the service and encouraging its use.

Given the relatively small number of children involved and the close proximity of the play area, smaller vehicles, rather than buses, could be employed for transporting the children (e.g., a van would be ideal). A periodic shuttle, going to and coming from the play area, would run on a designated route through the neighborhood. Names, addresses, and telephone numbers of all children using the service would be logged so that parents could be notified if necessary. The play area would have telephone and rest room facilities. Parents would be encouraged to accompany younger children at least on their initial visits to the play area.

In order to assure that properly qualified drivers are employed, that the vehicles are in good mechanical condition, and that proper insurance coverage is provided, it will probably be necessary to use paid services to provide the transportation. At least the following are possible sources for the transportation services:

1. Taxi companies. Some now operate shuttle services to and from school.

2. The school bus service, either school system or private contractor operated. As noted above, in many cases, mini-buses would be preferable to the larger school buses.

3. Busing services now operated by social service agencies (e.g., for the transportation of the retarded, handicapped, or the elderly).

4. Reliable private individuals who could demonstrate compliance with a prespecified set of driver qualifications, requirements for vehicle adequacy and condition, and insurance coverage requirements.

Countermeasure Selection/Implementation Model

It has been obvious from the outset of the project that supervision/guidance countermeasures would present special implementation problems. This is because, in most communities, countermeasures of this type have not been attempted, and an appropriate local government organizational structure does not exist at present for implementing them. For example, countermeasures involving physical modification of the street setting normally fall within the domain of a city's traffic engineering department, while the police are responsible for enforcement countermeasures. It is not obvious which subdivision of local government would implement countermeasures involving supervising and guiding children.

It is critical, therefore, not only to identify supervision/guidance countermeasures, but to structure a model organizational system which would accomplish the implementation of the countermeasures. The system would be installed within (i.e., integrated into) the normal operation of a host agency within city government. The host agency would differ from city to city, depending upon each city's unique organizational structure. In any case, the agency would likely have responsibilities relating to one or more of the following areas:

1. Public safety. Agencies might include the mayor/city manager's office, the public safety department, or the police department.

2. Recreation, including the city department of parks and public recreation.

3. Social service, including child care agencies and perhaps city planning.

4. Neighborhood development, to the extent that the agency's responsibilities included all areas in the city with high pedestrian accident rates.

The model countermeasure selection/implementation system has the following functions:

1. To identify the problem areas within the city, that is, those areas which experience high rates of child pedestrian accidents, particularly among preschoolers. These areas would be defined in terms of neighborhoods with physically delineated subareas, and with ethnic and/or racial commonalities (as viewed by the residents of these neighborhoods).

2. To recruit, select, and train a cadre of volunteers within each neighborhood.

3. To study the particular child pedestrian problem within each neighborhood and identify the specific countermeasure or countermeasures which are most appropriate

for it. Selection of countermeasure(s) would take into consideration the unique constraints and resources of the target neighborhoods.

4. To tailor the chosen countermeasure(s) to meet the specific needs of the neighborhoods. This would involve, for example, determining the specific areas within the neighborhood to be served by each countermeasure, selecting sites for play streets or alternate play sites, identifying the amount of help reqired to implement the countermeausre(s), and determining schedules of operation. The output of this activity would be an integrated countermeasure implementation/operation plan for the neighborhood.

5. To develop widespread support for the program in each neighborhood.

6. To implement the countermeasures program in each neighborhood.

7. To operate the program in each neighborhood on a continuing basis. This activity would involve providing logistical support to the programs and replacing/retraining volunteers who drop out of the program.

8. To periodically review each program and modify program operations to meet the changing needs of the neighborhood.

Figure 5-3 illustrates the organizational structure for the countermeasure selection/implementation system. The figure shows four levels within the system, two of which involve full-time paid personnel employed by the host agency and two involving volunteers. These levels are as follows:

1. Program Manager. The program manager is the highest level position within the program. His/her responsibilities would include:

   a. Establishing operation of the program within the city.

   b. Selecting and training area managers.

   c. Supervising the review of accident data, and the specification of areas (and neighborhoods within areas) with high numbers of child pedestrian accidents.

   d. Supervising and assisting in the recruitment, selection, and training of the neighborhood coordinators.

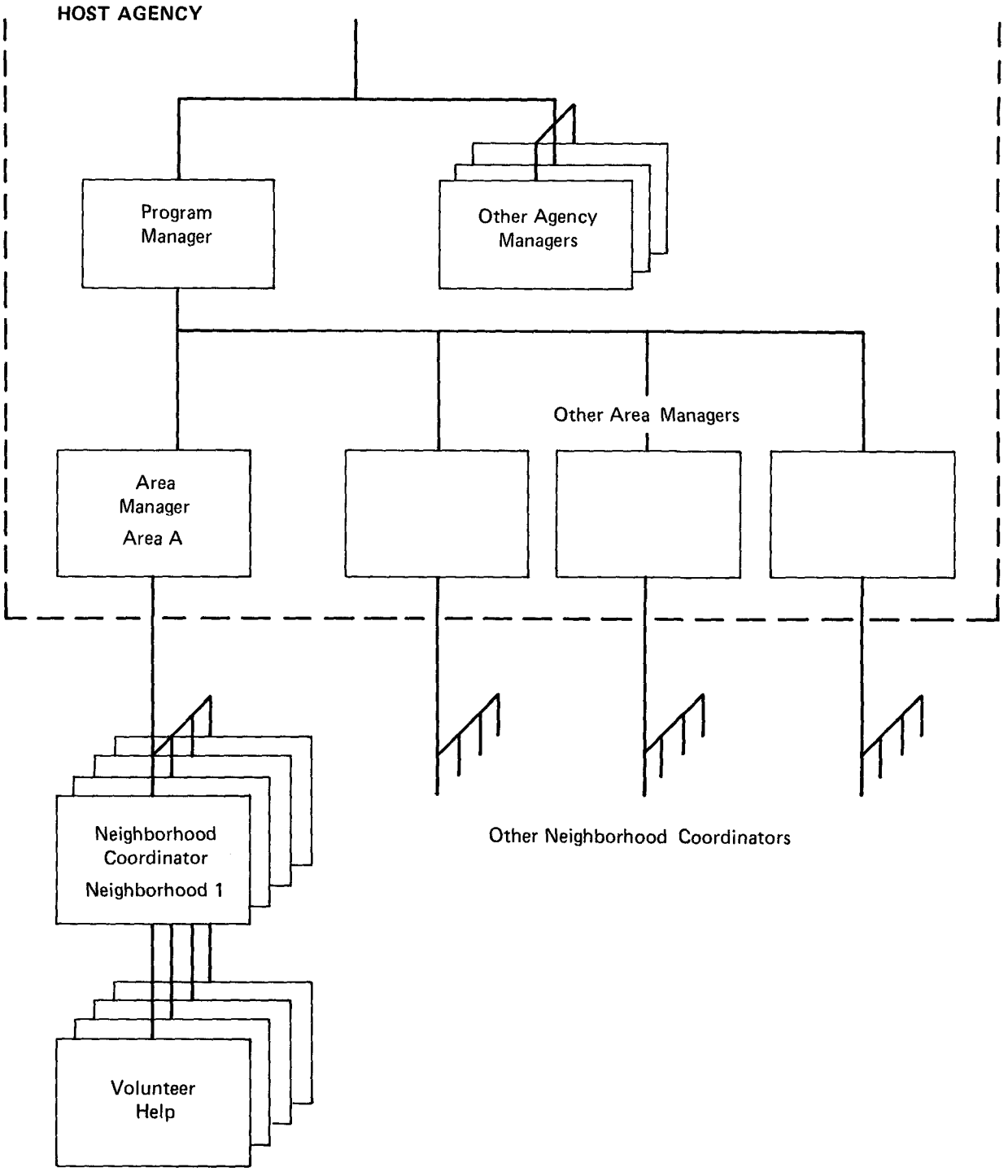


Figure 5-3. Organization of the Countermeasure Selection/Implementation System

e. Supervising and assisting in the development of plans for each area, in order to maximize effective use of resources and avoid duplication; approval of the plans.

f. Providing liaison with other city agencies, community groups, and businesses, to obtain resources (e.g., play equipment) and cooperation, as required, to implement the programs.

g. Providing information to the community at large concerning the overall program; generating public support for the overall program.

h. Supervising operation of the area program.

i. Instigating and supervising periodic reevaluation of the programs in each area; assisting in the modification of programs.

2. Area Manager. As presently envisioned, a moderate-sized city might have four to eight areas with high rates of child pedestrian accidents. Once delineated, each area would be assigned an area manager who, ideally, would be a resident of the area he/she manages. His/her functions would include:

a. Dividing the area into district neighborhoods.

b. Recruiting, selecting, and training the neighborhood coordinators and the volunteer help required in each neighborhood.

c. Working with each neighborhood coordinator to identify the unique child pedestrian problems and problem locations within the neighborhood; reviewing and selecting countermeasures, given the existing constraints and resources; formulating a neighborhood plan.

d. Integrating the neighborhood plans into an Area Plan to maximize cost-effectiveness of countermeasure implementation within the area.

e. Making frequent contacts with key individuals and parent groups within each

neighborhood to publicize the program and obtain support.

f. Providing equipment, materials and supplies as necessary to operate the countermeasures in the neighborhoods.

g. Supervising and assisting the neighborhood coordinators and the other volunteer help in the implementation and operation of the various countermeasures.

h. Reviewing the operation of the countermeasures to assure that they are effective in reducing the preschoolers' exposure to traffic; identifying other operational problems associated with the countermeasures; identifying changes in the needs/resources in each neighborhood; modifying neighborhood and area plans as required; implementing the modifications.

3. Neighborhood Coordinators. Each area would be divided into about four to eight neighborhoods, each no larger than about five blocks square. The relatively small size of this neighborhood would make it easier to develop the strong neighborhood identification necessary for obtaining volunteer help and donation of resources. A volunteer would be recruited in each neighborhood to become the neighborhood coordinator. The coordinator's duties would include:

a. Assisting the Area Manager in developing the neighborhood plan, including identifying resources and special conditions, problems, attitudes, and other factors which will constrain the selection of countermeasures.

b. Identifying and recruiting volunteer help.

c. Assisting in preparations to begin countermeasure implementation (e.g., assuring that materials and equipment are on hand, scheduling the volunteer help).

d. Spot-checking to assure that countermeasure activities are proceeding as scheduled and according to plan; identifying potential problems.

e. Acting as a first line information source, answering questions for parents concerning the countermeasure activities in the neighborhood.

4. Volunteer Help. The number of volunteers required in each neighborhood will depend upon the number and type of countermeasures implemented, requirements imposed by the need to special tailor countermeasures to meet the unique needs of the neighborhood, and the number of hours per week the countermeasures are in operation. The volunteers would be responsible for actually operating the countermeasure activities throughout the neighborhoods under the supervision of the Neighborhood Coordinator and the Area Manager. Each volunteer would be briefed by the Neighborhood Coordinator or Area Manager regarding the tasks they are to perform, their scheduled work times, and emergency procedures.

SECTION 6

RECOMMENDATIONS FOR TESTING OF COUNTERMEASURES

The previous section detailed a complex system for preventing preschool (and early school age) child pedestrian accidents. The system contains both a microstructure (i.e., what actions are to be taken to prevent unsafe street entries on a child-by-child and a situation-by-situation basis) and a macrostructure (i.e., how an entire city can be organized to attack its child pedestrian safety problem). The system was developed based on observation data, accident data, and consultation with pedestrian safety researchers. Persons who would potentially be involved in implementing the system were also consulted, albeit informally. The resulting system appears to be potentially effective and operationally feasible, but it remains to be evaluated by means of a field test.

Field Test Recommendation

The specific objectives of the field test would be to:

1. Develop detailed operational specifications for each of the nine delivery mechanisms described in Section 5.

2. Implement each of the mechanisms in representative neighborhoods that have a high rate of child pedestrian accidents.

3. Evaluate the mechanisms in terms of accident reduction, reduction in unsafe behaviors (e.g., ISSEs), problems associated with implementation and operation, and acceptability (e.g., to parents, motorists, implementation staff and city officials).

4. Revise and finalize the operational specifications.

The conduct of the field test would involve five tasks as discussed below.

Development of Materials. This task would involve developing detailed specifications for each delivery mechanism. Each specificaton would indicate the processes for implementing and operating the countermeasure, personnel requirments, recruitment and training guidelines, and the specific information the supervision/guidance agents must be given in order to effectively implement the countermeasure.

Each mechanism has unique requirements regarding the materials necessary to inform and train the personnel who would be involved in implementing it. Such materials would likely include texts, job aids and audiovisuals (i.e., slide/tape presentations, films and/or videotapes). These would be produced as part of this task, in accordance with the detailed specifications..

Identification of Test Sites. Sites must be selected for field testing the countermeasures which are typical of the neighborhoods in which high levels of child pedestrian accidents occur. They must also be typical in terms of the resources (e.g., neighborhood organizations) available to assist in countermeasure implementation and constraints (e.g., lack of alternate play sites) which might impede implementation. The approach followed in identifying site neighborhoods would parallel the process used in this study. Within each of the cities involved in this effort, full cooperation would be negotiated with officials who might be impacted by the operation of the countermeasures. This would assure smooth implementation and also a source of personnel for evaluating the implementation model (as discussed below).

Conduct of Countermeasures Tests. The actual field testing should have the following characteristics:

1. Several cities should be included (i.e., 4-6) representing a geographical distribution and varying physical characteristics (e.g., population density) relevant to pedestrian accident occurrence.

2. Several countermeasures should be implemented in each city such that each countermeasure is implemented at least twice across all cities.

3. Pre-implementation and post-implementation data should be collected for each site. This data would include:

    - Number of child pedestrian accidents.
    - Frequency of near-street play activities.
    - Presence of supervision.
    - Number of unsafe street entries and CVCs.
    - Type and frequency of play activities.
    - Utilization of alternate play sites.

    Within each city, these data should be collected for comparison neighborhoods in which no countermeasure implementation is occurring.

4. Each countermeasure should be implemented for a minimum of one year.

5. Each implementation site should be closely observed and supervised to:

   - Assure that implementation occurs in accordance with the countermeasure specifications.
   - Maintain the desired level of supervision/guidance activity.
   - Identify and resolve operation problems as they occur.
   - Collect data on countermeasure feasibility and acceptability from implementation personnel.

6. A survey of parents should be conducted in each implementation neighborhood to determine their attitudes concerning the countermeasure and problems they see in connection with it.

Revision of Materials. Each countermeasure would be evaluated with regard to accident reduction, reduction in unsafe play locations and behavior, number and seriousness of implementation and operational problems, and acceptability. Based on these evaluations, the decision may be made to discontinue development of some countermeasures. Those that show themselves effective with correctable problems would be evaluated to determine required materials revisions. The materials would then be revised accordingly.

Further Specification of the Countermeasures Implementation Model. Officials in each of the site cities should be kept informed of the progress and problems associated with the implementation and operation of the various countermeasures. At the conclusion of the operational period, group meetings should be held with these officials to examine the countermeasure implementation model and to identify problems the city might face in attempting to conduct a city-wide program using the countermeasures. Discussion would center on the circumstances under which the city could implement such a program, following the model of some variations of it. Such circumstances might include the redefinition of responsibilities for certain elements within the city government, additional manpower, and specific types and amounts of outside funding. The output of this step would be a set of recommendations for revising and detailing the model. These recommendations would be incorporated into a manual to guide communities in setting up and operating a program to reduce child pedestrian accidents.

Demonstration Project Recommendations

The field test would provide tested and improved countermeasure materials, as well as a manual for program implementation. The objective of the demonstration project would be to validate these materials by having a city implement a program using the materials. In contrast to the field

test, the demonstration project would be conducted with little outside support in setting up and operating the program. A major emphasis in the demonstration would be to identify the operational difficulties experienced by the city in conducting the program. Accident reduction should also be measured, although the emphasis could be placed on overall program effectiveness rather than the effectiveness of individual countermeasures.

All materials should again undergo revision, based on the outcome of the demonstration. The emphasis in this revision would be to produce materials suitable for nationwide distribution.