A PROFILE OF **WAKE COUNTY CHILDHOOD INJURY &**

MAY 2014

Executive Summary

JOHN REX ENDOWMENT

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Executive Summary

A. Background

The John Rex Endowment (JRE) seeks to support an environment where children and families in greater Wake County, NC live healthy lives. The mission of JRE underscores a fundamental belief that all children should have support to: reach their full potential, thrive, live their lives fully, and be physically, mentally, and emotionally well. In 2013, The John Rex Endowment (JRE) released a five-year plan entitled *Our Plan for Impact, 2013-2018 and* Injury Prevention is one of four focus areas in the plan.

To support the plan and funding efforts to prevent childhood injury in Wake County, NC, JRE funded a team from the University of North Carolina at Chapel Hill from August 1, 2013 to January 31, 2014 to complete the *Wake County Childhood Injury Prevention (IP) Assessment Project.* The project's main goals were to:

1. Summarize Wake County Childhood Injury Data and Gaps.
2. Create a Profile of Wake County Organizations Addressing Childhood Health and Safety.
3. Investigate the Connection between the Injury Data and the Injury Prevention activities of Organizations responding to an online survey.
4. Summarize Recommendations to foster learning and commitment, build capacity, and increase funding streams for injury prevention.

The service-oriented *Healthy Solutions* Team, within the Department of Health Behavior at The University of North Carolina (UNC) at Chapel Hill Gillings School of Global Public Health, was contracted to complete the project. *Healthy Solutions* team members collaborated with faculty and staff at the *Carolina Center for Health Informatics (CCHI)*, a practice-based, multidisciplinary research unit within the Department of Emergency Medicine at the University of North Carolina at Chapel Hill. The *Healthy Solutions* and *CCHI* Teams conducted regular conference calls and/or in-person meetings with staff at JRE to: a) clarify the scope of work, including review of criteria needed to implement project activities; b) provide updates on progress for each phase of work; and c) submit draft of methods or materials developed for the project to solicit feedback.

B. Methodology

To complete the *Wake County Childhood Injury Prevention Assessment Project*, UNC Team members completed four primary data collection and analysis activities:

1. An in-depth review of currently available secondary data sources about childhood injury mortality and morbidity among Wake County children ages 0 through 17;
2. The identification and survey of organizations, coalitions, networks, and taskforces currently working in Wake County to address childhood injury and violence prevention;
3. A comparison between the leading causes of injury identified by the secondary data and the degree to which organizations participating in this project are addressing those causes of injury; and
4. A review and summary of evidence-based practices for the leading causes of intentional and unintentional injury identified through secondary data.

C. Results

1. Wake County Injury and Violence Secondary Data

a. Summary of Leading Causes of Childhood Injury

Three main data sources were used to develop an overall picture of injury mortality and morbidity among children age 0 through 17 in Wake County, North Carolina:

1. *Mortality* (deaths) were identified in data available through the NC State Center for Health Statistics (SCHS) and the NC Violent Death Reporting System.
2. *Hospital Discharges* with injury diagnoses or coded external cause of injury were identified through the NC SCHS hospital discharge data file and accessed by staff in the Injury and Violence Prevention Branch at NC Division of Public Health (NC DPH).
3. *Emergency Department Visits* (injury related) were identified through NC DETECT data and accessed by UNC project staff under a Data Use Agreement with NC DPH.

Table ES-1 lists the top five injury causes for each data source. Color coding is used to depict if/how the five leading causes of injury within one data source were also a top five leading cause of injury in another source. In Table ES-2, we describe the process used to develop a list of the ten overall leading causes of injuries occurring among Wake County children ages 0 through 17. The ten leading injury causes are listed in column two of Table ES-2.

Table ES-1. Five leading injuries/events for mortality, hospital discharge, and emergency department data.

Rank	Mortality (2006-2011) N = 124			Hospital Discharge (2006-2011) N = 3,007			ED Visits (2006-2012) N = 138,047		
	Mortality Injury Causes	*#*	*%*	*Hospital Discharge Injury Causes*	*#*	*%*	*ED Visit Injury Causes*	*#*	*%*
1	MVC -Occupant	20	16.1	Falls	646	21.5	Falls	36,833	26.7
2	Assault	16	12.9	MVC Traffic-All	309	10.3	Struck By or Against	25,766	18.7
3	MVC -Pedestrian	15	12.1	Self-Inflicted/Self-Harm	272	9.0	MVC Traffic-Occupant	9,953	7.2
4	Self-Inflicted/Self-Harm	14	11.3	Burns	203	6.8	Natural/Environ-mental Factors	7,250	5.3
5	Unintentional Suffocation/Choking/ Breathing Threat	11	8.9	Assault	165	5.5	Bicycle injury/ crashes	2,994	2.2

Table ES-2. Process used to Identify the 10 overall leading injury causes, across three primary data sources.

Process Summary	*10 Leading Injury Causes*
• We studied the data in Table ES-1 by moving from left to right across data sources, and from rank 1 to 5 within each data source. • *Motor Vehicle Crashes (MVCs)* (occupant, pedestrian, all) were one of the five leading causes for all three data sources, thus their placement as the 1st and 3rd leading injury causes. MVC-Pedestrian was kept separate as the 3rd leading cause given differences in prevention approaches for occupants versus pedestrians. • *Assault* and *Self-Inflicted/Self Harm* were in the top five injury causes for both mortality and hospital discharges, thus their placement as 2nd and 4th leading causes. • *Falls* was in the top five injury causes for both hospital discharges and ED visits, and the number of fall events was significantly higher than the number of deaths due to *Unintentional Suffocation*, thus the placement of *Falls* and *Suffocation* in the 5th and 6th leading causes, respectively. • *Burns*, *Struck By/Against*, *Natural/Environmental Factors*, and *Bicycle Injury/Crashes* were placed in the 7th through 10th positions because they were among the five leading injury causes for hospital discharge or ED visits only.	1. MVC Traffic-Occupant 2. Assault 3. MVC Traffic-Pedestrian 4. Self-Inflicted/Self-Harm 5. Falls 6. Unintentional Suffocation 7. Burns 8. Struck By or Against 9. Natural/Environmental Factors 10. Bicycle Injury/Crashes

2. Organization survey

A total of 110 organizations participated in the John Rex Endowment Wake County Childhood Health and Safety Profile Survey (Response Rate=71%).

a. Organizational Demographics and Outreach

Organization Type: Half (50%) of the responding organizations were small, with fewer than 10 full-time employees. The median number of employees is 16 and the median number of full time employees is 11. Almost three quarters (74%) of organizations selected 'non-profit' as their entity type, with another 18% being state or local government agency.

Geographical Service Areas: Organizations were asked to identify their geographical service areas; the majority of organizations selected Wake County, followed in descending order by the Greater Triangle Area, The City of Raleigh, The State of North Carolina and lastly, The United States.

Target Populations: Organizations were asked to identify whether they specifically targeted selected populations. Over half of the organizations indicated specifically targeting (from highest to lowest): low income (72%); African-American (52%); and Hispanic (51%); populations. Organizations identified different types of population groups that their organization interacted with, including over half working directly with Children (85%), Parents/caregivers (78%), Teachers (67%), Policy Makers/ Decision Makers (64%), and medical professionals (58%).

b. Injury Prevention Focus of Organizations

About half of the organizations identified education (71%), funding (55%), advocacy (54%) and program evaluation (49%) as very important to their work. Almost all organizations (88%) indicated that childhood injury and/or violence prevention was somewhat to extremely important.

c. Organizational Resources

Organizational Capacity: Organizations reported their abilities to identify resources (i.e. locate evidence based practices; find childhood injury data; identify funding sources; and identify other local childhood injury and/or violence prevention networks) and integrate resources (i.e. use evidence based practices in injury prevention programs; use childhood injury data; obtain funding; and use existing local childhood injury and/or violence prevention network). Respondents self-reported their capacity using a four point scale from high level of capacity to no capacity. Obtaining funding, identifying funding, researching evidence based programs and finding relevant data sources received the lowest scores for organizational capacity. Using research about evidence based programs, identifying and using Wake County injury and/or violence networks, and using data for program planning and implementation received the highest scores.

Data Sources: Survey respondents were asked to identify data sources used by their organization. Over half of the organizations identified using at least one source of national level data (66%), North Carolina state level data (70.9%) and Wake County level data (57.3%). The data sources used most frequently were NC Division of Public Health (including the State Center for Health Statistics) (63.1%) and the Center for Disease Control and Prevention (59.2%).

Funding Sources: Survey respondents were asked to identify the types of funding they received. The most common funding was received from private donors (43.1%) followed by NC funding Sources, such

as North Carolina Foundations (John Rex Endowment, Kate B. Reynolds, The Duke Foundation) (36.3%), and the North Carolina Department of Health and Human Services (27.5%). Most organizations (45%) identified receiving one to three funding sources and several organizations (22%) indicated that they did not receive funding from external sources.

Capacity Building Activities: Survey respondents were asked to rate on a four point scale how valuable specific capacity building activities are to their organizational work. The majority (81.2%) of organizations rated receiving resources related to childhood injury and violence prevention as very or somewhat valuable. The majority also responded that networking with Wake County stakeholders (77.2%), receiving Wake County data reports (76.2%) and participating in information networking sessions (76.2%) were very or somewhat valuable.

d. Organizational Characteristics by Organizational Capacity Levels

The majority of organizations (N=98 organizations), were assigned a "capacity" index score based on self-reported responses to the survey. The capacity index, ranging from a low of eight to a high of 32, was divided into three equal categories based on the frequency distribution. Categories were divided into High Capacity (greater than or equal to 25), Medium Capacity (less than 25 and greater than or equal to 21) and Low Capacity (less than 21). Indicators for the organizational capacity sub groups were reviewed and we reported differences greater than 10% from the overall average.

Injury Prevention Focus of Organizations

- Almost all (87%) of the High Capacity organizations reported Childhood Injury and Violence Prevention as "Very Important" or "Extremely Important" to their organizational work focus, compared to Medium Capacity (69%) and Low Capacity (35%).
- High Capacity organizations were more likely to report Program Evaluation (64%), Research/Data (42%) and Communication/Media (45%) as very important to their organizational work focus compared to other organizations.
- High Capacity organizations were more likely to work in Child Abuse/Maltreatment (79%), Self Inflicted/Self Harm (61%), and Firearms (30%), than other organizations (Table ES-3).

Organizational Resources by Organizational Capacity Level

- High Capacity organizations were more likely to use all levels of data in some capacity.
- High Capacity organizations were more likely to receive funding from each funding source.

e. Relationship among the Leading Causes of Childhood Injury, Injury Prevention Focus, and Programmatic Approach

The secondary data analysis indentified the leading injury causes for Wake County children; of these, two are intentional and eight are unintentional (Table ES-3). More organizations identified working in intentional injuries and/or violence then unintentional injuries. Almost half of all organizations identified working in Assault (including Assaults/physical violence (57%), Child Abuse/Maltreatment (66%), Sexual Violence (47%)); or Self-Inflicted/Self-Harm (46%), more than any leading unintentional injury cause. Across the leading injury causes, there are a greater percentage of High Capacity organizations working in intentional areas.

Assault and Self-Inflicted/Self-Harm were identified as priority areas for organizations regardless of capacity level. MVC Traffic- Occupant was identified as the leading cause for mortality and morbidity in Wake County; however, fewer than half of the organizations identified working in this field. Across

all eight unintentional leading causes, fewer than half of the organizations reported working within any unintentional injury cause.

Table ES-3. Organizations by leading ten events and organizational capacity level.

Leading Injury Types	*All Organizations*		*High Capacity*		*Med Capacity*		*Low Capacity*	
	N=110	*%*	*N=33*	*%*	*N=33*	*%*	*N=32*	*%*
1. MVC Traffic-Occupant	38	36%	15	45%	9	27%	9	28%
2. Assault								
a. Assault/Physical Violence	62	57%	22	67%	18	55%	17	53%
b. Child Abuse/ Maltreatment (physical, sexual, emotional)	71	66%	26	79%	18	55%	22	69%
c. Sexual Violence (e.g. assault, rape)	51	47%	18	55%	11	33%	18	56%
3. MVC Traffic-Pedestrian	30	28%	12	36%	9	27%	6	19%
4. Self-Inflicted/ Self-Harm	50	46%	20	61%	11	33%	15	47%
5. Falls	25	23%	9	27%	9	27%	6	19%
6. Unintentional Suffocation	12	11%	6	18%	3	9%	2	6%
7. Burns	15	14%	6	18%	6	18%	3	9%
8. Struck By or Against								
9. a. Natural/Environmental Factors	24	22%	9	27%	11	33%	4	13%
b. Animal bites	11	10%	4	12%	4	12%	2	6%
10. Bicycle Injury/Crashes	25	23%	8	24%	10	30%	4	13%

Estimated program impact scores increased when programs were coded for higher levels on the Socio-Ecologic Framework, Frieden's Health Impact Pyramid, and the Three E's of injury prevention. Estimated program impact index ranged from three to 12, with an average of 5.8. In addition to coding for the various impact frameworks, all programs were assigned an injury category code; intentional only, unintentional only, or both intentional and unintentional. High Capacity organizations had the highest averages for program impact. The highest program impact average is for high capacity unintentional injury programs (8.3) (Table ES-4).

Table ES-4. Average program impact index by injury intent and organization capacity level, range low (3) to high (13).

Injury Type	*All Programs N= 243*	*High Capacity N=110*	*Med Capacity N= 75*	*Low Capacity N=46*
Intentional Only	4.5	4.6	4.3	4.6
Unintentional Only	6.6	8.3	4.4	5.6
Both Intentional and Unintentional	6.9	8.1	6.5	5.8
All programs	5.8	6.3	5.5	5.6

3. Coalition Survey

A total of 15 coalitions (response rate 83%) completed the John Rex Endowment Childhood Health and Safety Profile Survey, with a median of 25 active members. Specific aspects of their responses include:

- The average size is 57 members per network; 60% are small networks (0-50 members) and 40% are large networks (50+ members).
- At least 60% of all coalitions identified specifically targeting African-American, Caucasian, Hispanic, urban and low income populations.
- Almost one third (30%) of coalitions identified advocacy as a type of service provided, followed by direct services (21%), and research evaluation (18%). One (7%) coalition identified funding as a type of service provided.

- The majority of coalitions reported that childhood injury and/or violence prevention was very to extremely important, with the average of 5.9, or very important.
- Over half of the coalitions identified working in motor vehicle crashes (67%) and poisoning (53%).
- Overall, most coalitions reported having medium to high levels of capacity on the capacity indicators. The highest level of capacity was reported for the use of childhood injury data for prioritizing program development and planning (64%), followed by the ability to find relevant childhood injury data for prioritizing program development and planning.
- All of the coalitions reported using data. Almost all (80%) reported using at least one data source from North Carolina.
- The capacity building activities reported as 'somewhat valuable' to 'very valuable' were attending trainings on evidence-based injury prevention programs, interventions, and strategies (39%), followed by attending trainings focused on building capacity in resource development (38%) and participating with Wake County stakeholders working in injury prevention to dialogue about childhood injury priorities and networking (37%).
- Our analysis also revealed that coalitions completing the survey (although we did not create an impact index for them) identified working with policy makers (80%) and public safety officials (80%) most often. This is in contrast with the programs submitted by organizations, which most frequently identified working with children (85%) and parents (78%).

4. Summary of Evidence Based Practices

A total of 234 programs, interventions, and countermeasures were included in and Evidence-based Practices Compilation developed for this project. Programs were coded for injury causes that address a combination of intentional and unintentional injury using our standardized terminology. The compilation of injury prevention programs includes interventions from 16 registries.

Programs addressing unintentional injury were the most common (50%) followed by programs that address intentional injuries (31%). Several of the programs included in the National Registry of Evidence-based Programs and Practices (NREPP) addressed risk factors that relate to intentional and sometimes unintentional injuries. These risk factors were included in the compilation to provide additional information on the prevention of injury and violence. The most common risk factor was alcohol (48%), followed by social functioning (31%) and drugs (27%).

Targeted age groups and/or setting were identified for the programs based on categories from NREPP. Age groups were considered 'targeted' when the program directly addressed a specific age group (e.g. age group is early childhood for Early Head Start programs) or if they were targeted for behavior change by an intervention (e.g. age groups are adolescent, young adulthood, and adult for Blood Alcohol Content Laws).

D. Discussion

1. Secondary Data

For the leading causes of childhood injury, Table ES-5 summarizes by injury type (e.g., Intentional and Unintentional), factors associated with secondary data, including: rank for morbidity and mortality leading causes; age distributions; sex distributions; injury location; and costs.

Table ES-5. Summary of leading causes of childhood injury in Wake County, NC by injury type.
Unintentional Injury
#1 Motor Vehicle Traffic Crash – Occupants a. There were twice as many male deaths than females deaths (Males=41, Females=20). b. Older children (age groups 10-14 and 15-17) are at highest risk of MVC-occupant injury. c. Many children injured or killed in MVCs are coded as "Unspecified." d. MVCs are expensive injuries, with the second highest hospital charges reported in the hospital discharge data. e. A higher than expected proportion of MVC-occupant injury related ED visits were self-pay (18.2%).
#3 Motor Vehicle Traffic Crash – Pedestrian a. Child pedestrians hit by motor vehicles are likely to be fatalities (15 fatalities to 310 ED visits). b. Over 60% of child pedestrian fatalities (66.7%) and ED visits (61.8%) are males. c. Many (42.9%) pedestrian deaths were children under 5 years of age but 83.8% of ED visits for pedestrian injury were 5-17 years of age, with 33.8% in the 15-17 year age group (i.e. younger children are more vulnerable, more likely to die from these injuries). d. More than a quarter (25.7%) of the pedestrian injury ED visits were admitted to the hospital or transferred to another hospital. e. "Hot spots" for crashes involving child pedestrians have been identified in a previous JRE funded study.
#5 Falls a. Falls are overwhelmingly the leading injury cause of hospital discharges (21.5%) and ED visits (26.7%) for Wake County children. b. Most fall injuries are to males (60.5% hospital discharge, 58.1% ED visits). c. All age groups have high numbers of fall related injury. d. There were over 3,000 ED visits for injury related to falling from playground equipment and over 2,000 ED visits for falls from bed. e. Many fall related ED visits do not have specific sub-mechanism codes assigned (14.8% are Unspecified Fall).
#6 Unintentional Suffocation a. Eleven children died due to unintentional suffocation or other breathing threats (e.g. choking), and eight were under 1 year of age. b. There were only 47 hospital discharges and 87 ED visits due to unintentional suffocation. c. More suffocation deaths were females (6 of 11, 54.5%) but 52.9% of ED visits due to suffocation were males. d. Almost half (48.8%) the ED visits due to suffocation listed Medicaid/Medicare as the expected payment source. e. Over half the ED visits due to suffocation resulted in admission to the hospital (51.2%).
#7 Burns a. Burns include injury from both fire and hot liquids, steam and other hot substances/objects. The vast majority (83.0%) of burn injuries treated in the ED were from hot liquids/steam/substances/objects. b. Burn injury was the 4th leading cause of injury related hospital discharges, responsible for 6.8%, and the 6th leading cause of injury related ED visits, with over 1,500 burn injuries identified in this study. c. Males accounted for 55% of the burn related ED visits. d. Over half the burn related ED visits (50.2%) were for children ages 1-4 years of age. e. Most burns did not require admission to the hospital, with 81.6% discharged home.
#8 Struck by or against a. This category includes being *unintentionally* struck by or striking against people or objects, with or without subsequent fall. About 43 percent (42.6%) of these are coded as "Other", with no further information. b. Almost 26,000 ED visits (18.7%) were for injury resulting from being struck by or striking against something, thus being the second leading cause of injury related ED visits. c. 35% of these injuries are due to being struck or striking against something or someone in sports activity. d. 13.3% of these injuries involved furniture or falling objects. e. These injuries do not include injuries caused by falling and then striking against something.
#9 Natural and environmental factors a. This category includes a wide variety of injury mechanisms; most (92.2%) were due to injury involving animals or insects (e.g. dog bites, bee stings). b. Weather related injury (exposure to heat/cold, extreme weather) was responsible for only 4.1% of the ED visits due to natural and environmental factors but resulted in five child deaths, with four of these deaths from one cataclysmic storm.

Table ES-5. Summary of leading causes of childhood injury in Wake County, NC by injury type.
c. Dog bites resulted in an average of 278 ED visits for Wake County children per year. d. Children ages 1-4 years of age were most at risk, accounting for 34.5% of ED visits for injury from natural and environmental factors; children ages 5-9 represented 28.2%. e. Male children were the injured patient in 55.5% of the ED visits for this cause.
#10 Bicycle Injury a. Injuries from falls and crashes involving bicycles, not including those involving a motor vehicle, led to over 3,000 ED visits for Wake County children during the years 2006-2012. b. Bicycle injury related ED visits are overwhelmingly for male patients (70.8%). c. Children ages 5-9 are at highest risk of bicycle injury, followed by those ages 10-14. d. Bicycle injuries are responsible for 85.8% of all Other Transportation related injury, which include injuries related to animals being ridden, animal-drawn vehicles, other non-motorized road vehicles, railway transport, water transport and water craft, and other vehicles not elsewhere classifiable.
Other - Poisoning a. More children are hospitalized and visit the ED for self-inflicted poisoning than for unintentional poisoning. b. Many ED visits for poisoning may be averted by calls to the Carolinas Poison Center hotline; over 32,000 calls to the poison control hotline were made for Wake County children ages 0 through 17 during the years 2006-2012. c. Most calls (68.1%) are for children ages 1-4 years. d. "Analgesics" (e.g. aspirin, acetaminophen, ibuprofen) were a leading substance of exposure for all age groups. "Cosmetics/personal care products" was the leading substance group for exposures by children ages 1-4 years. e. Most exposures reported through calls to the poison control hotline did not result in clinical effects or serious medical outcomes. f. Results highlight the importance of looking at unintentional and self-inflicted poisoning separately. While many prevention strategies may address both intentional and unintentional poisoning, these two sub-sets of childhood poisoning affect different groups of children and have different healthcare outcomes. g. Calls to the CPC for child exposures to potentially harmful materials are important to note because numbers are much higher than what we see for poisonings in the ED Visit data; calls to CPC may be keeping children at low risk from a potential poisoning exposure out of the ED.
Intentional Injury
#2 Assault a. Children under age five are at highest risk of death from assault. b. Children 15-17 years of age are most likely to be hospitalized or visit the ED for injuries related to assault. c. Over half the child deaths from assault were female while approximately two out of three hospital discharges and ED visits for assault were for males. d. ED visits for assault are more likely than other injury related ED visits to have Medicaid/Medicare as the expected payment. e. Firearm assault injuries had the highest reported median hospital charges of any injury type reported and a median hospital length of stay of five days.
#4 Self Inflected / Self Harm a. Eight of the 14 child suicide deaths were for children 10-14 years old. b. Ten of the 14 child suicide deaths were from hanging. c. For hospital discharges and ED visits for self-inflicted injury, approximately 70% were for ages 15-17 years. d. Most suicide deaths (78.6%) were male but most hospital discharges (71.0%) and ED visits (70.3%) for self inflected injury were females. Males tend to chose more lethal means to attempt self-harm. e. Non-fatal self inflicted injury was overwhelmingly due to poisoning (71.7% hospital discharges, 71.3% ED visits). f. Most ED visits for self-inflicted injury were admitted to the hospital or transferred to another hospital (70.5%). g. Anecdotally, we suspect that there may be a reluctance to code injuries as self-harm in children under 10 years old; these may be more likely to receive an "Undetermined" intent code.

2. Comparison of Organizational Capacity and Interest in Capacity Building Activities

Forty percent or more (range of 44% to 56%) of the organizations responding to the online survey rated all capacity building activities assessed as 'very valuable.' High Capacity and Medium Capacity organizations, in particular, expressed interest in all capacity building activities described in the survey. Information collected in

the organization survey, however, does not allow us to determine why Low Capacity organizations were less interested in capacity building activities.

3. Relationship Among the Leading Causes of Childhood Injury, Injury Prevention Focus, and Programmatic Approach

a. Leading Cause of Injury and Injury Prevention Focus

When considering results from both secondary data and the organization survey conducted for this project, it is valuable to identify the degree to which organizations in Wake County are addressing childhood injury and violence prevention. To what degree are these organizations focused on the leading causes of childhood injury in Wake County? To examine this question, we identified two Tiers of Leading Injury Causes to investigate the distribution of effort across organizations and then to specifically assess if there are any differences in injury prevention focus by organizational capacity.

The leading injury causes in Tier I appear to be appropriately addressed, with almost 50% of all organizations and 60% of High Capacity organizations addressing prevention in these leading injury causes (Table ES-6). Fewer than 40% of coalitions identified working in these leading injury causes. Among all organizations (regardless of capacity level) and coalitions, additional emphasis on these leading causes of childhood injury would be beneficial.

With approximately 20% of All, High Capacity and Medium Capacity organizations, and coalitions, addressing the leading injury causes in Tier II, enhanced emphasis to address these leading causes of childhood injury seems warranted.

Table ES-6. Average Percentage of Organizations Working to Prevent Injuries by Ten Leading Injury Causes Tiers.

Leading Injury Event Tiers[a]	*All Organizations*	*High Capacity*	*Medium Capacity*	*Low Capacity*	*Coalitions*
	N = 110	*N = 33*	*N = 33*	*N = 32*	*N=15*
Tier I 1. MVC Traffic-Occupant 2. Assault a. Assault/Physical Violence b. Child Abuse/ Maltreatment (physical, sexual, emotional) c. Sexual Violence (e.g. assault, rape) 3. MVC Traffic-Pedestrian 4. Self-Inflicted/ Self-Harm	46.7%	57.2%	38.3%	45.3%	36.7%
Tier II 5. Falls 6. Unintentional Suffocation 7. Burns 8. Struck By or Against[b] 9. Natural/Environmental Factors a. Animal bites 10. Bicycle Injury/Crashes	17.2%	21.0%	21.5%	11.0%	17.9%

[a] *Leading Injury Event Tiers were created by reviewing the differences between leading causes of mortality leading causes of morbidity.*
[b] *Struck By or Against was not collected in the organization survey.*

b. Injury Prevention Focus and Programmatic Approach

Considering results from both secondary data and the organization survey conducted for this project, it is also important to identify the degree to which organizations in Wake County addressing childhood injury and violence prevention are appropriately applying a public health approach to their efforts to prevent childhood injury in Wake County, NC.

The field of injury prevention has significantly developed over the past sixty years. Years behind the field of chronic disease, it was not until 1981 when the first national conference on injury control was sponsored by the CDC at Johns Hopkins (Christoffel & Gallagher, 2000). This national conference was followed by a CDC publication in 1982 providing an Injury Control and Implementation Plan for State and Local Governments. In 1990, the first six states mandated E-coding as a standard practice. In 1993, President Bill Clinton declared injury a public health problem. In 1999, the Institute of Medicine published "Reducing the Burden of Injury" (Bonnie, Fulco, & Liverman, 1999), drawing attention and comprehensive research into the spotlight. These, among other pivotal events over the past six decades, have made significant strides in the public health contribution to the prevention of injury and/or violence.

The complexity of public health issues requires the implementation of multi-level approaches to address childhood injury (e.g. population based approaches, individual education approaches). Programs that are focused on individual knowledge, skills, and behavior (e.g. counseling and education), are necessary; however, additional interventions should address population-level factors (e.g. socioeconomic factors, environmental conditions, public policy changes). Population-level interventions will increase the public health impact, leading to a reduction in childhood injury mortality and morbidity (Frieden, 2010).

The estimated program impact index, developed by coding programs listed by responding organizations, was based on several public health models, including: Socio-Ecological Framework; Frieden's Health Impact; and the 3E's of injury prevention (Environment, Education, Enforcement). Our estimated program index measure for an organization represents the average estimated program impact index for the programs listed by the organization.

Our analysis reveals that self-reported capacity can make a difference, in that High Capacity organizations were more likely to have a higher estimated program impact index for programs addressing intentional injury (8.3) and for programs addressing both intentional and unintentional injury events (8.1).

4. Accessibility of Evidence-Based Practices

The accessibility of readily available and comprehensive evidence-based resources for intentional injuries and/or violence (including risk factors) was greater than the accessibility of comparable resources related to unintentional injuries. More effort was required to identify and compile programs and interventions which addressed unintentional injuries. Information about unintentional injuries was commonly found in the form of tips for individuals on safety practices, laws and policies, and environmental approaches to modify the physical environment. Many curriculums and programs are available to educate individuals about safe behaviors and safety practices. However we were not able to identify a comprehensive database to review supporting evidence of such interventions. The development and dissemination of a registry, for programs addressing unintentional injuries, would increase the ability for the public to easily access and use such programs.

E. Recommendations

1. Foster Learning, Commitment, and Capacity among Organizations Addressing Childhood Injury & Violence Prevention in Wake County, NC

a. Continued Engagement with Participating Organizations and Coalitions

We support plans by JRE to: make available to the public the results from this project; provide follow-up technical assistance to organizations interested in increasing their capacity and program effectiveness; and promote discussion about the data collection methods and recommendations. The strategic use of the findings from this project will help to both increase awareness of injury and violence prevention in Wake County, as well as to influence the actions that can be taken by multiple stakeholders (e.g., local organizations/coalitions, state agencies, academic/research institutions) to further the efforts already underway to prevent childhood injury and violence in Wake County, NC.

b. Enhancing Evaluation Methods to Improve Effectiveness

The degree to which childhood injury or violence prevention organizations evaluate their programs is important as evaluation results can increase program effectiveness. A focused emphasis on evaluation could include assessing practices for formative, process, impact, and outcome evaluation. Such an assessment could include the degree to which organizations: a) develop measurements for short/medium/long-term indicators and logic models; b) collect data and use reliable data collection methods; and/or c) select appropriate data analysis methods. JRE could specifically identify and focus capacity building on evaluation components that relate to 'program effectiveness' and 'program impact.' We recommend addressing, on a programmatic level, the identification of the following topics: 1) Reach which includes: program frequency of contact; duration of contact; intensity of contact; and population groups targeted/reached by individual programs; 2) Identify whether they use Evidence–based Practices which includes: application of programs identified as *Recommended* and/or *Promising*; and 3) Fidelity of program implementation which includes: delivery schedule; meeting training requirements; determining if program messages were received by intended targets; and documentation through process evaluation.

c. Capacity Building Courses and Evaluation Consultation

Relevant entities could use multiple methods to deliver capacity building services to organizations addressing childhood injury and violence prevention in Wake County, NC.

- Short-courses: in collaboration with the NC Injury & Violence Prevention Branch, UNC Injury Prevention Research Center and/or Department of Health Behavior, mini-courses in program planning, implementation, and evaluation for childhood injury and violence prevention could be developed. These courses could be specialized one to three day courses that could be supported and tailored to those working in intentional or unintentional injuries, including the identification of best-practices.
- Fellowship-learning experience: organizations could be asked to nominate staff to attend a series of program planning, implementation, and evaluation training courses (e.g., over a year) to support a project identified specifically for the fellowship program. The fellows would receive guidance on their project and have the opportunity to increase their knowledge and skill though a series of workshops held during the year long program.
- Implementing injury prevention programs and/or retaining or linking to program and evaluation consultants: to support organizations/coalitions implementing injury prevention programs, the services of program and evaluation consultants could be retained to ensure that evaluation is

conducted. The quality of evaluation will be improved through the development of tailored evaluation plans. In addition, the capacity of local organizations to conduct evaluation will be enhanced.

d. Use Evidence-based Practice Compilation

We recommend that JRE consider the information summarized in this project's Compilation of evidence-based practice registries to: 1) prioritize JRE supported activities based on evidence; 2) identify effective program(s) for the leading cause of injury; 3) encourage (or require) injury prevention activities using high impact approaches; and/or 4) identify programs tailored for specific settings/populations.

2. Childhood Injury Secondary Data

a. Further Analysis of Leading Cause of Childhood Injury Data

To further study causes of childhood injury in Wake County, NC, we provide several recommendations organized by the leading injury causes identified in this project by secondary data.

#1 - Motor Vehicle Traffic Crash – Occupants. Work with NC DOT to link crash report data with EMS and ED visit data. The IVP Branch is considering this idea should funds become available.

#2 – Assault. Apply Patty Schnitzer's algorithm (Schnitzer, Slusher, Kruse, & Tarleton, 2011) for estimating child maltreatment and neglect based on *weighting* of diagnosis and mechanism of injury codes, as well as combinations of these. Meghan Shanahan, a public health researcher at UNC Injury Prevention Research Center (IPRC), applied this method to two years of ED visits by Wake County children and identified 126 children who were likely to have experienced maltreatment, almost as many as identified by specific codes for the 7 years of ED visit data reported here. ED data may capture a different population of children who experience maltreatment than those identified through Child Protective Services (CPS) data, although the age distribution for each type of abuse is similar between the two data sources (Shanahan, Proescholdbell, Waller, & Deyneka, 2013).

#3 - Motor Vehicle Traffic Crash – Pedestrian. Work with NC DOT to try to link crash data with healthcare data for child pedestrian injury. JRE has previously funded a project that used NC DOT crash data to examine child pedestrian crashes in Wake County. An innovative project in Boston, MA, has utilized crash data, EMS data, and ED visits data to: examine the characteristics of pedestrian and bicycle crashes resulting in injury; develop and implement interventions; and evaluate the impact of those interventions. JRE could potentially build on projects they have already funded in this area to expand the data used to inform child pedestrian prevention efforts in Wake County, if this is determined to be a priority area.

#4 - Self Inflected / Self Harm. Promote accurate hospital coding for poisoning to reduce "Undetermined" poisoning codes. Sharing the results of this project with hospitals in Wake County, including highlighting areas of potential improvement in data quality through hospital coding practices, may indirectly improve the accuracy of this coding in the future.

#5 – Falls. A detailed report of Fall related injuries resulting in ED visits and/or hospital admissions should be completed. Analysis of school and community based efforts to prevent fall injuries to children should be undertaken. Ways to determine severity of fall injury and outcomes should be found or developed.

#8 - Struck by or against. Struck by or against is a non-specific and diffuse cause of injury but accounts for a large proportion of childhood injury morbidity in Wake County. Many of these injuries are sports

related, as are many fall injuries. We did not explore this area in great detail in this study. A detailed report of sports related injury to children should be undertaken which would investigate all the various codes related to injury in sports activities. By undertaking a project to specifically address sports related injury, including those identified through struck by or against codes, fall codes, activity codes, and place of occurrence codes, as well as through key word searches of chief complaints and triage notes, we can better describe these injuries and identify prevention strategies.

#10 - Bicycle Injury. Undertake a study of bicycle injury in Wake County that utilizes ED data, including details from chief complaints and triage notes, EMS responses, and NC DOT crash reports (for those involving a motor vehicle on a public road) to gain a deeper understanding of who is at risk and where to better inform prevention efforts.

Other – Poisoning. Expand the exploration of poisoning injury in Wake County children through deeper analysis of the poisoning codes used in the ED visit and hospital discharge data, as well as the CPC call data. This is currently an area of intense public health interest nationally and in North Carolina, offering opportunities to partner and leverage resources.

b. Additional Analysis of E-Code Mechanism and Sub-Mechanism Data

To further inform what has been learned about the leading causes of injury in Wake County for this project, we suggest additional detailed analysis, at the mechanism and sub-mechanism level utilizing the depth of E-coding available in the Wake County ED visit data. Conducting such an analysis would increase understanding for some of the leading causes of injury and better inform injury prevention efforts in the community. Examples of additional analysis include:

- A special analysis into sports related injuries in Wake County children is warranted, if this becomes an area of injury identified as a priority for prevention efforts in Wake County. Such an analysis would use all codes related to sports activity, from various mechanisms (e.g. struck by/against, falls) as well as activity and place of occurrence codes, to identify these injuries and describe further the circumstances of injury and the population experiencing these injuries.
- Expand the record level review of injury related ED visits with multiple mechanism of injury codes, using the text information available in the triage notes and chief complaints, for those causes of injury determined to be priorities for prevention in Wake County. This will allow more detailed understanding of certain injury mechanisms, such as falls, self-inflicted, or pedestrian injury.
- Conduct analyses utilizing ZIP code level data for leading causes of injury in the ED visit data. This is a challenging task because 5-digit ZIP code is the most granular place of residency variable available in the ED visit data, however, ZIP codes do not conform nicely to geographic boundaries in Wake County.
- The entire coding scheme for diagnosis and intent/mechanism of injury in both hospital discharge and ED visit data will change in 2014, from ICD-9-CM to ICD-10-CM. The potential for detailed coding of circumstances of injury will expand, as will the potential for miscoding. This change in the secondary data available should be monitored and its impact on local data for surveillance and evaluation examined. This will be taking place at the state level through ongoing work at NC DETECT.

c. Secondary Injury Data

- The ability to readily generate a multi-year child injury mortality report at the county level would be a welcome addition to the tools currently available through the State Center for Health Statistics (SCHS) website. This would make it much easier for community organizations to generate county specific injury mortality data to inform injury prevention efforts.
- Making hospital discharge data readily available, to projects such as this one, should be considered by the State Center for Health Statistics.

- The Emergency Department visit data for childhood injury in Wake County were generally very good. Continued monitoring of data completeness for E-codes is necessary to insure high quality data for Wake County.
- Many ED visit records in Wake County include multiple codes for mechanism of injury. Improving the specificity of the codes used and decreasing the incidence of conflicting codes (e.g. motor vehicle crash – driver and motor vehicle crash – passenger) would be helpful to anyone attempting to use these data for program planning and evaluation.