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Abstract

Childhood injuries lead to increased morbidity and result in significant costs to public insurance programs. People with mental retardation, most of whom are covered by Medicaid, are at high risk for injury, which has implications for community inclusion, a central policy goal. Medicaid data from inpatient, outpatient, and long-term care settings represent an important new resource for injury surveillance in this population. Injury prevalence for 8.4 million Medicaid-eligible children in 26 states was measured using 1999 eligibility and claims data; 36.9% Medicaid beneficiaries ages 1 to 20 with mental retardation had at least one injury claim as compared with 23.5% of those without mental retardation. Prevalence rates are reported by gender and age for a variety of injury types.

Injuries are a significant and costly problem for children and adolescents in the United States (National Center for Injury Prevention and Control, 2002). Injuries may pose a special threat to children and adolescents with mental retardation due to enhanced risk factors and the potential challenges related to community integration and inclusion. For people with mental retardation, inclusion in community life is a central policy objective. Injuries may limit community inclusion by causing an interruption of education, treatment or rehabilitation services, decreased independence in functioning, and/or placements in acute or postacute care settings (Spreat & Baker-Potts, 1983; Tannenbaum, Lipworth, & Baker, 1989).

Estimates suggest that the Medicaid program, a vital primary source of health care coverage for children and adolescents with mental retardation, annually pays up to 28% of injury-related health and ancillary care costs for all children in the United States (Anderson, Larson, Lakin, & Kwak, 2003; Bishai, McCauley, & Trifiletti, 2002; MacKenzie, 1990). Few epidemiological studies of injury include data about children and adolescents with mental retardation (Dunne, Asher, & Rivara, 1993; Sherrard, Tonge, & Ozanne-Smith, 2002). However, research that is focused on this population suggests that children and adolescents with mental retardation have almost double the risk of unintentional injury and related hospitalizations when compared with the general population (Sherrard, Tonge, & Ozanne-Smith, 2001a, 2001b).

By drawing on data from state Medicaid programs, a new source for information about injury prevalence among children and adolescents with mental retardation, we can obtain a broader picture of injury (inclusive of unintentional and intentional causation) in this population and in a convenience comparison of youth without mental retardation. Data on gender, age range, and mental retardation status presented here build on existing research focused on the cause of injuries in small samples. These analyses provide a more comprehensive picture of injury prevalence in a large group who received injury-related care in inpatient, outpatient, and long-term care settings. National Medicaid health services data, derived from claims data, represent an important new resource because they enable analysts to access information on large populations across diverse geographical regions. The source includes primary and secondary diagnoses submitted by all treating providers that can be used to identify children and adolescents with mental retardation by demographic characteristics, health services utilization, and injury types and prevalence. Few previous researchers have offered such a broad view of prevalence for injuries among children and adolescents with mental retardation. Instead, most descriptions of injuries in this population provide only a partial picture of the overall problem because they are generally based on limited data, such as self-report, death certificates, emergency department data, trauma registries, or hospital discharge data systems.

In the present study we address a gap in knowledge about injury prevalence among children and adolescents with mental retardation by compiling data from administrative health care claim records from state Medicaid programs across the United States. Analyses of all Medicaid beneficiaries ages 20 and younger have shown that older age groups and being male are associated with increased injury risk in the general population (Garnick et al., 2006). This project aims to provide policymakers and interest groups with basic information about patterns of treated injuries among Medicaid beneficiaries with mental retardation who are from 1 to 20 years of age.

Method

We measured injury frequency for Medicaid-eligible children using calendar year 1999 Medicaid eligibility and claims data collected by the Centers for Medicare and Medicaid Services (CMS) and included in the Medicaid Statistical Information System. Frequencies and proportions are reported along with confidence intervals for the proportions reported calculated at the .05 level. Medicaid eligibility and claims records for each child include demographic information (i.e., age and gender); monthly eligibility information (i.e., participation in traditional Medicaid and Medicaid managed care plans) and treatment reason and detail (i.e., *International Classification of Diseases, Ninth Revision, Clinical Modification—ICD-9-CM*, World Health Organization, 1999) and Current Procedural Terminology/Healthcare Common Procedure Codes.

Independent variables derived from these data included gender and age range, both of which are commonly examined in injury prevalence studies. Our choice of age ranges was made based on formats most often used by the United States Centers for Disease Control and Prevention's National Center on Injury Prevention and Control for the purposes of greatest comparability with existing data from that data source. Given that our goal in the study was to examine prevalence among youth through age 20, we extended the National Center on Injury Prevention and Control's definition in the highest youth age range from 15 to 19 to 15 to 20. We were not able to include Medicaid children enrolled in health maintenance organizations (HMOs) or other plans that did not report patient encounter/service level detail. Some Medicaid managed care plans did provide encounter records with detailed diagnostic and treatment data, and we included that information in our injury statistics.

Diagnostic Codes

We identified injuries using a set of diagnostic codes from the *ICD-9-CM*, based on the Barell Matrix (Barell, Aharonson-Daniel, & Fingerhut, 2002). This matrix standardizes data selection and reports, using a two-dimensional array representing nature of injury diagnosis and body region. Injury diagnoses in the *ICD-9-CM* code range of 800 to 995 were selected according to 3-digit code ranges for the injury categories set forth by the Barrell Matrix. Individuals and claims were considered only for those Medicaid beneficiaries ages 1 through 20 at the end of calendar year (CY) 1999, who were eligible for Medicaid in at least one month in CY 1999. We selected those beneficiaries who had at least one diagnosis of mental retardation within CY 1999 observed in beneficiary claim histories (as mental retardation or other diagnostic criteria of this nature are not included in eligibility files). *Mental retardation* was defined based on the presence of at least one of the *ICD-9-CM* diagnostic codes in the range 317 through 319. A group of beneficiaries with no indication of mental retardation were used for comparison purposes. After implementing the exclusion rules described below, we were able to examine claims data from 26 different states.

Data Quality and Completeness

We excluded states or portions of states by Medicaid plan type and month when data were not reported (e.g., Hawaii and Idaho had not reported any data for 1999 at the time of data preparation) or were judged to be inadequate after a review of data quality and completeness according to the rules outlined below. First, we excluded data in states where specialized Medicaid plans for people with mental retardation were known to be capitated. For Medicaid plans with managed care orientations, cascading payment systems can lead to insufficient service level data. In such a system, capitated payment are made to treating providers to cover all costs, without the need for the submission of individual claims (Garnick, Hendrickes, & Comstock, 1996; Iezzoni, 2002). Second, we excluded invalid *ICD-9-CM* injury codes. Only valid 3-digit injury diagnoses in the *ICD-9-CM* range of 800 to 995 were included. It was also necessary to exclude one valid code in this range, namely, Code 888, which falls in the injury category for open wounds. In the Medicaid Statistical Information System when the *ICD-9-CM* on a claim is missing, the code "888" is entered. Third, 43 children and adolescents with mental retardation without a gender value in the beneficiary eligibility data were excluded.

Fourth, we excluded states and/or months of data by looking for injury underreporting and problematic claims. A manual state-by-state review was performed to evaluate monthly data trends with regards to the following measures: total enrollment, total claims, injury rates, raw counts of beneficiaries with an injury, total expenditures, and expenditures per claim. These measures were reviewed for each plan type within each state and were informative with regards to in-state variation and to how states compared to national trends. In some cases, this review led to the exclusion of complete plan types within states that had obviously missing or incomplete data for the majority of the year. In other cases, only certain months of data were excluded from a plan type within a state when the review measures revealed data that severely deviated from the monthly trends within the state. Most exclusions of this type occurred due to incomplete data from a state in the final months of the year. In addition, in some cases adequate enrollment and treatment data were present, and it was only necessary to exclude expenditure data on either the state level or for months within the state. Complete consensus was reached among the panel of reviewers for all exclusions. Exclusions were applied to both population numerator and denominators in the case and comparison groups. Population counts were weighted by months of enrollment as some beneficiaries were only enrolled for part of the year.

We examined both prevalence and incidence of injuries among Medicaid beneficiaries ages 20 and younger using an episode-based approach. An episode algorithm was implemented that identifies incident injuries from the reporting and timing of diagnostic and procedure information commonly associated with the treatment of a new injury. Specifically, the algorithm, described in detail in an upcoming paper, characterizes the following elements: (a) the identification of an incident injury through the presence of injury-specific treatment or through the clustering of medical services within a given time period, (b) the expected length of the injury episode, and (c) a minimum clean period of time (with no injury diagnoses) between episodes for the same injury. The algorithm is sensitive to both high- and low-severity injuries as well as to single versus multiple injury events. Because the services for injuries experienced during the previous year can continue into the next year, we found, as expected, that the incidence is always lower than the prevalence of injuries. However, because differences were small, we present prevalence data in this paper.

Overall, we examined injury prevalence for 8,406,369 people, 0.6% of whom had a mental retardation claim (n = 49,775). The range of rates of mental retardation prevalence reported in the 26 states observed was 0.1% in New Mexico to 1.6% in Maine, with a mean across these states of 0.7%. (See Appendix A for more state-specific information.) These percentages are slightly lower than those of nationwide estimates of the noninstitutionalized population with mental retardation derived from the National Health Interview Survey–Disability Panel, from 1994–1995, which suggest that the population with mental retardation accounts for 0.78% of the general population (Larson et al., 2001). We attribute this difference to an expected undercount of mental retardation diagnoses in claims data due to stigma and the fact that codes on any given claim may only represent issues for which a patient is currently treated (Iezzoni, 2002).

Results

In CY 1999, 37 out of 100 children and adolescents with mental retardation had been treated for an injury as opposed to 23 out of 100 in the comparison group. In total and in each individual demographic group, a higher percentage of children and adolescents with mental retardation were treated for at least one injury in 1999 than in the comparison group (see Table 1). Figure 1 presents overall injury rates by age range, gender, and mental

Table 1 Medicaid Injury Claims and Injured Beneficiaries by Group, Age, and Gender

All Medicaid beneficiaries age 20 and younger	Beneficiaries with injury diagnoses			
	Mental retardation		No mental retardation	
	n	%	*n*	%
Males	11,607	38.5	1,112,883	23.5
1–4	1,076	43.5	309,109	18.3
5–9	2,610	34.6	283,428	17.3
0–14	3,650	40.0	296,366	15.1
15–20	4,271	38.9	223,980	20.3
Females	6,737	34.3	865,618	13.9
1–4	588	36.0	246,269	14.4
5–9	1,460	33.0	212,111	11.9
10–14	2,035	34.1	211,511	15.3
15–20	2,654	34.5	195,727	14.7

Note: Calculations are from the Center for Medicare and Medicaid's Medicaid Statistical Information System. Denominators for the percentages reported are located in the Appendix in the totals section.

retardation status with confidence intervals for proportions. Both males and females with mental retardation had higher overall injury prevalence rates in all four age groups. There were no statistically significant differences between males and females with mental retardation. However, males without mental retardation had higher overall injury prevalence rates in all age groups when compared with their female counterparts. Table 2 presents data on the 10 most frequent injury types among children and adolescents with mental retardation. Controlling for age and gender, children and adolescents with mental retardation were more likely to experience most injury types than were their counterparts without mental retardation. Especially notable are the odds ratios for poisonings, foreign body injuries, dislocation, and internal injury prevalence.

In order to determine whether the general patterns of higher injury prevalence were consistent across injury types by age range, we examined confidence intervals for the proportions of injury among the top three injury categories for the sample and comparison groups by gender and mental retardation status (see Figure 2). With regard to contusion/superficial injury rates, no differences were found between children with and without mental retardation in the 1 to 4 age group, suggesting that absence of mental retardation does not mediate rates of contusion/superficial injury among young children. Both males and females with mental retardation had higher rates of contusion/superficial injury in the 5 to 9, 10 to 14, and 15 to 20 age groups. Males and females with mental retardation did not evidence statistically significant differences when compared. However, males without mental retardation had higher rates of contusion/superficial injury in all four age groups when compared with their female counterparts.

With regard to open-wound injury rates, we found no differences between children with and those without mental retardation in the 1 to 4 and 5 to 9 age groups, suggesting that absence of mental retardation does not mediate rates of open-wound injury among young children and young school-age children. Higher rates of open-wound injuries were found in the 10 to 14 age group for both genders with mental retardation as compared to their counterparts without mental retardation. However, although this difference held for females in the 15 to 20 age group, it did not hold for males in that age group. Among children with mental retardation, males had higher rates of open-wound injury than did females in the 10 to 14 and 15 to 20 age groups. Among children without mental retardation, males had statistically significantly higher rates of open-wound prevalence in each of the four age ranges when compared to females.

With regard to fracture injury rates, males with mental retardation had a higher rate of fracture injury prevalence only in the 5 to 9 age group when compared to males without mental retardation. Females with mental retardation, however, had higher rates of fracture injury prevalence rates in all four age groups. Within the group of children with mental retardation, females in the 1 to 4 age range had a higher rate of fracture injuries than did their male counterparts, but no other statistically significant differences were found within the other three age groups. Among children without mental retardation, males had higher rates of fracture injury prevalence in all age groups.

Discussion

Looking at a broad sweep of data for roughly half of the Medicaid population in the United States who are between ages 1 and 20, we found that youth with mental retardation have more over-

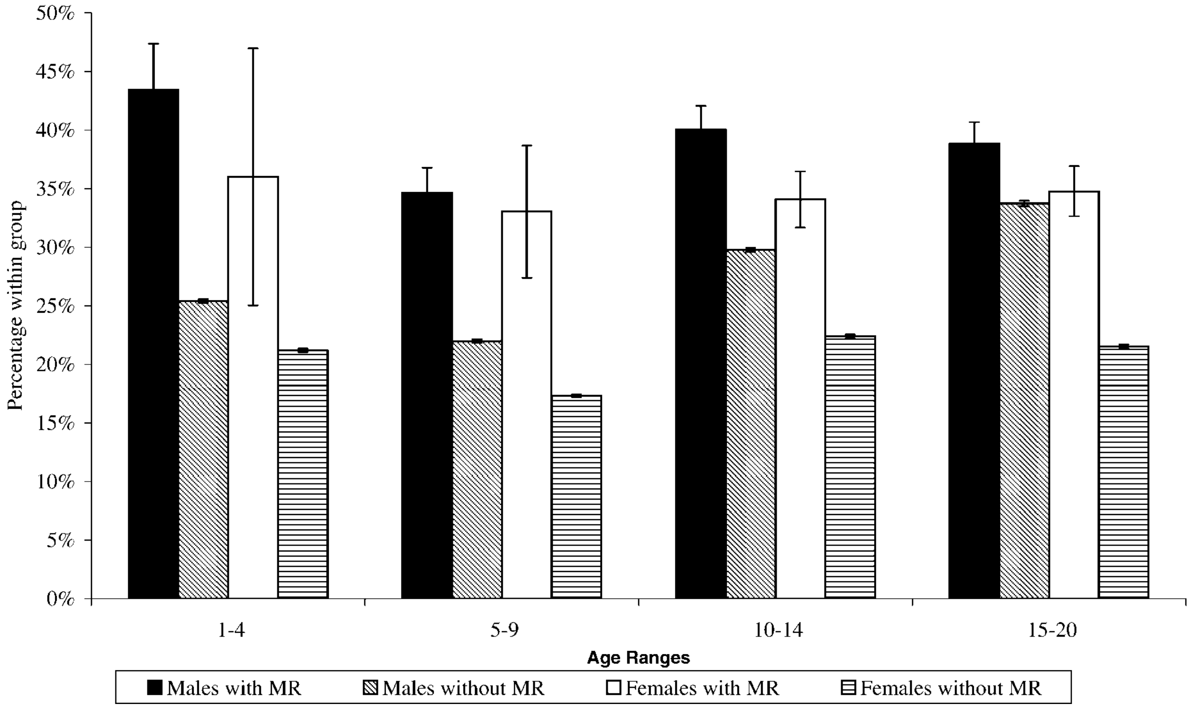

Figure 1 Overall injury rate among Medicaid beneficiaries by gender and mental retardation (MR) status. The 1 to 4 age group: males with MR (M-MR) ± 3.9%; males without MR (M-NMR) ± 0.1%; females with MR (F-MR) ± 2.1% and females without MR (F-NMR) ± 0.1%; 5 to 9 age group: M-MR ±2.1%; M-NMR ± 0.1%; F-MR ± 5.6% and F-NMR ± 0.1%; 10 to 14 age group: M-MR ± 2.0%; M-NMR ± 0.1%; F-MR ± 2.4%, and F-NMR ±0.1%; 15 to 20 age group: M-MR ±1.8%; M-NMR ±0.2%; F-MR ±2.1% and F-NMR ±0.1%.

all injuries than do their counterparts without mental retardation. These findings persist across the first 20 years of life. As expected, our findings support existing research on the increased risk of injury among people with mental retardation and suggest that children and adolescents with mental retardation are more likely to experience injury than are their counterparts without mental retardation. However, we found that the higher prevalence of treated injury per 100 children and adolescents with mental retardation was less than the factor of two increase expected from prior research (Sherrard, Tonge, & Ozanne-Smith, 2002). We hypothesize that this could be influenced by a higher risk of injury among Medicaid-covered children and adolescents without mental retardation than would be experienced by the comparison population used in the other research. Our research differed from existing data on injury risk for this population that showed no gender difference in injury prevalence (Sherrard et al., 2001a, 2001b).

Increased Injury Risk

Four factors may place children and adolescents with mental retardation at increased risk of sustaining injuries, and possibly more severe injuries, such as poisoning or internal injuries, than are children and adolescents in the general population. These factors are physical issues and/or co-occurring physical disabilities, functional capacity, higher rates of disturbed behavior, and psychopathology and the tendency for higher rates of epilepsy and seizure disorders. First, common physical issues and/or co-occurring disabilities, such as poor balance and or gross-motor skills coordination, may cause this population to have greater risk of injury. This may be especially true with regard to fall-related injuries, such as those leading to contusions and fractures, for example (Sherrard et al., 2001a). Low bone mineral density, which can affect fracture risk, is more prevalent among people with mental retardation (Aspray et al., 1998; Lohiya, Lohiya, & Tan-Figueroa, 2003; Ryder et al., 2003). Obesity has

Table 2 Proportion of Top Ten Injury Categories Among Medicaid Beneficiaries by Group, Age, and Gender

Category	Children with MR *n*	Children with MR %	Children without MR *n*	Children without MR %	Unadjusted OR[a]	95% CI[b]	Age/gender adjusted OR[a]	95% CI
Contusion/superficial	3,598	7.23	441,905	5.26	1.41	1.36–1.46	1.38	1.34–1.43
Open wound	2,912	5.85	353,512	4.21	1.42	1.37–1.47	1.42	1.36–1.47
Fracture	1,865	3.75	194,010	2.31	1.65	1.57–1.73	1.33	1.27–1.39
Sprain & strain	1,705	3.43	241,140	2.87	1.20	1.14–1.26	0.80	0.77–0.84
Foreign body	861	1.73	58,799	0.70	2.50	2.34–2.68	3.45	3.22–3.69
Internal injury	783	1.57	50,922	0.61	2.62	2.44–2.82	2.49	2.32–2.68
Poisoning	557	1.12	25,317	0.30	3.75	3.44–4.08	3.72	3.42–4.05
Dislocation	540	1.09	32,416	0.39	2.83	2.60–3.09	2.74	2.51–2.98
Toxic effect	476	0.96	90,339	1.08	0.89	0.81–0.97	1.58	1.44–1.73
Burn	327	0.66	44,666	0.53	1.24	1.11–1.38	1.60	1.44–1.79
Total[b]	18,344	36.85	1,978,501	23.54	1.90	1.86–1.93	1.74	1.71–1.77

Note: Source was the Centers for Medicare and Medicaid Statistical Information System (MSIS).
[a]Adjusted OR (odds ratios) were obtained from logistic regression models controlling for gender and age and represent the likelihood of an injury among children with mental retardation in comparison to children without mental retardation. [b]Total includes injury categories not reported in the top 10 group listed in this table (e.g., late effects, nerve injury, unspecified injury).

been correlated with increased injury risk, a condition more prevalent among individuals with than without mental retardation (Horwitz, Kirker, Owens, & Zigler, 2000) and can diminish bone mineral content and may be associated with increased incidence of fracture injuries (Whiting, 2002).

Second, issues and conditions related to functional capacity can impact injury risk because a diagnosis of mental retardation may impair hazard recognition (i.e., limited problem-solving skills, the propensity for either inattention or impulsivity, and increased potential for hearing and eyesight issues). These impairments lead to difficulties in negotiating the environment and decreased coping skills in day-to-day life (Konarski, Sutton, & Huffman, 1997; Wang, McDermott, & Sease, 2002). This could affect levels of risk for poisoning, toxic effects, or body injuries. Overall, level of mental retardation has been related to increased risk of injury, especially for those at the high (more activity leads to higher risk) and low (low functional capacity leads to increased risk) ends of the mental retardation spectrum (Spreat & Baker-Potts, 1983; Tannenbaum et al., 1989).

Third, higher rates of challenging behavior and psychopathology (most notably obsessive-compulsive disorder and self-injurious behaviors [SIB]) among children and adolescents with mental retardation can also place this population at increased risk for a range of injuries, including open-wound or contusion injuries (Bussing, Menvielle, & Zima, 1996; Maughan & Goodman, 2004; Patja, Livanainen, Raitasuo, & Lonnqvist, 2001; Rivara, 1995). Psychotropic medications are often prescribed in the treatment of SIBs. Among adolescent boys with mental retardation, alcohol and illicit drug use was found to be more prevalent than among their counterparts without mental retardation (Slayter-Hernández & Krauss, 2003). This finding has implications for injury because alcohol and drug use are correlated with increased injuries, such as fractures or contusions sustained from fights, for example (Huang, 1981; Pack, Wallander, & Browne, 1998). Finally, children and adolescents with mental retardation who exhibit challenging behaviors and psychopathology may be more likely to experience physical abuse, resulting, for example, in internal injuries or contusions (Braden et al., 2003; McCartney & Campbell, 2003; Nettelbeck & Wilson, 2002; Vig & Kaminer, 2002).

Fourth, the population with mental retardation experiences a higher rate of epilepsy or seizure disorders (McDermott et al., 2004; Morgan, Baxter, & Kerr, 2003), which can lead to injuries caused by falls (Lohiya, Crinella, Tan-Figueroa, Caires, & Lohiya, 1999).

It is important to note the limitations of this analysis that relate to generalizability and data completeness. Although up to 55% of children and adolescents with mental retardation may be covered by Medicaid, the generalizability of our prevalence findings is limited to children and adolescents with and those without mental retardation who are eligible for Medicaid health care services, the majority of whom were covered in fee-for-service plans (Anderson, Larson, Lakin, & Kwak, 2003). Despite limitations related to identification of children and adolescents with mental retardation and/or with injuries who received coverage in an HMO format, with the potential for capitation, the estimates of injury prevalence presented here offer a general picture of the characteristics of a large group of children and adolescents with mental retardation who are being treated for injuries in 26 states. To the extent that injured Medicaid beneficiaries do not receive Medicaid-covered treatment, these statistics may represent a lower bound for injury prevalence. For example, some serious injuries from motor vehicle crashes may be covered by automobile insurance, and some minor injuries do not result in medical treatment. Institutional billing practices may contribute to undercounts of more minor injuries among children and adolescents with mental retardation as their injury-related care may be provided within the institution itself and, therefore, may not be noted in administrative claims (Morgan, Ahmed, & Kerr, 2000).

The *ICD-9-CM* diagnostic codes, which are the primary source of all clinical insight for a study reliant on administrative data, are not always clinically accurate as they are "not meant to tell stories, rather to generate reimbursement" (Iezzoni, 2002, p. 348). We postulated that injury codes are less prone to this problem than are codes for mental retardation due, for example, to stigma. Because we observed data from all provider types, this problem may not present as much of a limitation to the study. Administrative data can eliminate some problems presented by the use of self or proxy report (e.g., problems of caretaker recall bias in injury surveillance research—Sherrad et al., 2001b) or acquiescence, a common concern in surveys of people with mental retardation (Finlay & Lyons, 2002).

Although boys with mental retardation are more likely than girls to experience injury, both generally experience higher rates of injury than do their counterparts without mental retardation. This has implications for the realization of cost savings from enhanced prevention and safety programming for children and adolescents with mental retardation, especially for parents, caregivers, teachers, and other professionals working with children and adolescents with mental retardation. Because some injuries, such as contusions and open wounds, may be related to SIBs, more research is needed to address effective treatment approaches for preventing or managing that behavior. The known effectiveness of injury prevention efforts points to the potential for reducing both costs and human suffering by targeting children and adolescents with mental retardation for research in this area (Sherrard, Ozanne-Smith, & Staines, 2004). The high prevalence of fractures suggests that prevention activities should be targeted in this area, including a focus on fall prevention, nutrition during critical periods of growth, and efforts to prevent fractures among physically active youth, such as Special Olympics athletes.

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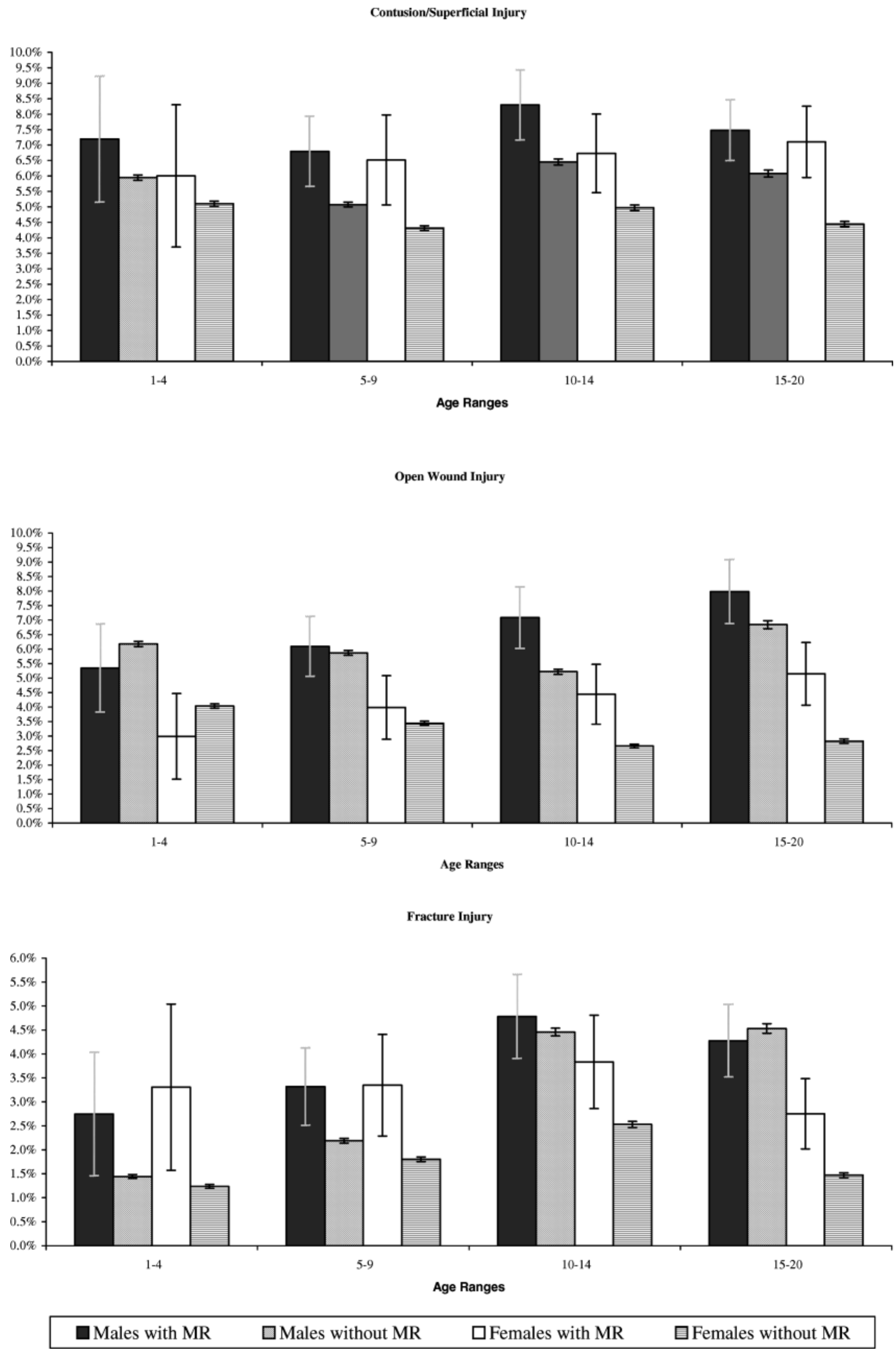
Figure 2 Rates of specific injury types among Medicaid beneficiaries by gender, age range, and mental retardation (MR) status: 1999. Top graph: 1 to 4 age group: M-MR ±2.0%; M-NMR ±0.1%; F-MR ± 2.3% and F-NMR ± 0.1%; 5 to 9 age group: M-MR ±1.1%; M-NMR ±0.1%; F-MR ±1.5% and F-NMR ±0.1%; 10 to 14 age group: M-MR ±1.1%; M-NMR ±0.1%; F-MR ± 1.3% and F-NMR ±0.1%; 15 to 20 age group: M-MR ±1.0%; M-NMR ±0.2%; F-MR ±1.2% and F-NMR ±0.1%. Middle graph: 1 to 4 age group: M-MR ±1.5%; M-NMR ±0.1%; F-MR ±1.5% and F-NMR ±0.1%; 5 to 9 age group: M-MR ±1.0%; M-NMR ±0.1%; F-MR ±1.1% and F-NMR ±0.1%; 10 to 14 age group: M-MR ±1.1%; M-NMR ±0.1%; F-MR ±1.0% and F-NMR ±0.1%; 15 to 20 age group: M-MR ±1.1%; M-NMR ±0.2%; F-MR ±1.1% and F-NMR ±0.1%. Bottom graph: 1 to 4 age group: M-MR ±1.3%; M-NMR ±0.04%; F-MR ±1.7%; F-NMR ±0.04%; 5 to 9 age group: M-MR ±0.8%; M-NMR ±0.1; F-MR ±1.1%; F-NMR ±0.04; 10 to 14 age group: M-MR ±0.9%; M-NMR ±0.1; F-MR ±1.0%; F-NMR ±0.06; 15 to 20 age group: M-MR ±0.8%; M-NMR ±0.1%; F-MR ±0.7%; F-NMR ±0.05%.


Contusion/Superficial Injury
1-4
5-9
10-14
15-20
Age Ranges
Open Wound Injury
1-4
5-9
10-14
15-20
Age Ranges
Fracture Injury
1-4
5-9
10-14
15-20
Age Ranges
Males with MR
Males without MR
Females with MR
Females without MR

This research also provides insight into the types of planning efforts, staffing procedures, and institutional designs that can mitigate injury risk (Columbus, 2002). Enhanced staff training, the promotion of safe environments in school, supported living, and/or intermediate care settings have the potential to result in a safer environment for this population and for cost savings to the Medicaid program at both the state and federal levels.

Almost 40% of children and adolescents with mental retardation in this sample are experiencing injuries that may lead to reduced potential for community inclusion. Injuries may also lead to increased costs to educational systems, Medicaid's residential and nonresidential community-based Home and Community Based Services (HCBS) Waiver programs for people with mental retardation, federal and state Medicaid programs in general, and other state social service agency budgets. Through the specific identification of highly prevalent rates of treatment for specific injuries by gender, age range, and risk group, Medicaid data offer a powerful tool. Although these data do not provide sufficient cross-state information about causes of injuries or the locations in which these injuries were sustained, data from some specific states may have well-reported e-coding data. However, despite these potential problems, we have provided the first ever large-scale assessment of the treated injury prevalence in a population of children and adolescents with mental retardation. This study has important implications for future studies, specifically regarding the need for additional research on both injury prevention initiatives and costs of care related to injury treatment in this population. These results, coupled with state-specific mortality and morbidity information for people with mental retardation, can support the targeting of new and ongoing prevention initiatives as well as assisting in the evaluation of their effectiveness.

References

Anderson, L., Larson, S., Lakin, C., & Kwak, N. (2003). *DD data brief: Health insurance coverage and health care experiences of persons with disabilities in the NHIS-D* (1). Minneapolis: University of Minnesota, Institute on Community Inclusion.

Barell, V., Aharonson-Daniel, L., & Fingerhut, L. (2002). An introduction to the Barell body region by nature of injury diagnosis matrix. *Injury Prevention, 8,* 91–96.

Bishai, D., McCauley, J., & Trifiletti, L. (2002, July/August). The burden of injury in preschool children in an urban Medicaid managed care organization. *Ambulatory Pediatrics, 2,* 279–283.

Braden, K., Swanson, S., & Scala, C. (2003). Injuries to children and adolescents who had preinjury cognitive impairment: A ten-year retrospective review. *Archives of Pediatrics and Adolescent Medicine, 157,* 336–340.

Bussing, R., Menvielle, E., & Zima, B. (1996). Relationship between behavioral problems and unintentional injuries in U.S. children and adolescents. *Archives of Pediatrics and Adolescent Medicine, 150,* 50–56.

Columbus, O. (2002). *Incident management literature review for California. Department of Developmental Services.* Sacramento: California Independent Risk Assessment and Mitigation Services and The Columbus Organization.

Dunne, R., Asher, K., & Rivara, F. (1993). Injuries in young people with developmental disabilities: Comparative investigation from the 1988 National Health Interview Survey. *Mental Retardation, 31,* 83–88.

Finlay, W., & Lyons, E. (2002). Acquiescence in interviews with people who have mental retardation. *Mental Retardation, 40,* 14–29.

Garnick, D., Bishop, C., Slayter, E., Gilden, D., Kubisiak, J., & Hakim, R. (2006). *Using national information on Medicaid beneficiaries: A new approach to monitoring childhood injuries.* Manuscript submitted for publication.

Garnick, D., Hendricks, A., & Comstock, C. (1996). Using health insurance claims data to analyze substance abuse charges and utilization. *Managed Care Research and Review, 53,* 352–368.

Horwitz, S., Kirker, B., Owens, P., & Zigler, E. (2000). *The health status and needs of individuals with mental retardation.* New Haven: Yale University, Department of Epidemiology and Public Health; Yale University School of Medicine, Department of Psychology; and Yale University and Special Olympics.

Huang, A. (1981). The drinking behavior of the educable mentally retarded and the nonretarded students. *Journal of Alcohol and Drug Education, 26,* 41–50.

Iezzoni, L. (2002). Using administrative data to study persons with disabilities. *The Milbank Quarterly, 80,* 347–380.

Konarski, E. A, Sutton, K., & Huffman, A. (1997). Personal characteristics associated with episodes of injury in a residential facility. *American Journal on Mental Retardation, 102,* 37–44.

Larson, S. A., Lakin, K. C., Anderson, L., Kwak, N., Lee, J. H., & Anderson, D. (2001). Prevalence of mental retardation and developmental disabilities: Estimates from the 1994/1995 National Health Interview Survey disability supplements. *American Journal on Mental Retardation, 106,* 231–252.

Lohiya, G., Crinella, F., Tan-Figueroa, L., Caires, S., & Lohiya, S. (1999). Fracture epidemiology and control in a developmental center. *Western Journal of Medicine, 170,* 203–209.

Lohiya, G., Lohiya, S., & Tan-Figueroa, L. (2003). Eighteen fractures in a man with profound mental retardation. *Mental Retardation, 37,* 47–51.

MacKenzie, E. (1990). Acute hospital costs of pediatric trauma in the United States: How much and who pays? *Journal of Pediatric Surgery, 25,* 970–976.

McCartney, J., & Campbell, V. (2003). Confirmed abuse cases in public residential facilities for persons with mental retardation: A multi-state study. *Mental Retardation, 36,* 465–473.

McDermott, S., Moran, R., Platt, T., Wood, H., Isaac, T., & Dasari, S. (2004). Prevalence of epilepsy in adults with mental retardation and related disabilities in primary care. *American Journal on Mental Retardation, 110,* 48–56.

Morgan, C., Ahmed, Z., & Kerr, M. (2000). Social deprivation and prevalence of epilepsy and associated health usage. *Journal of Neurology, Neurosurgery, and Psychiatry, 69,* 13–17.

Morgan, C., Baxter, H., & Kerr, M. (2003). Prevalence of epilepsy and associate health service utilization and mortality among patients with intellectual disability. *American Journal on Mental Retardation, 108,* 293–300.

National Center for Injury Prevention and Control. (2002). *Injury fact book 2001–2002.* Atlanta: Centers for Disease Control and Prevention.

Nettelbeck, T., & Wilson, C. (2002). Personal vulnerability to victimization of people with mental retardation. *Trauma, Violence & Abuse, 3,* 289–307.

Nivara, F. (1995). Developmental and behavioral issues in childhood injury prevention. *Developmental and Behavioral Pediatrics, 16,* 362–370.

Pack, R., Wallander, J., & Browne, D. (1998). Health risk behaviors of African American adolescents with mild mental retardation: Prevalence depends on measurement method. *American Journal on Mental Retardation, 102,* 409–420.

Patja, K., Livanainen, M., Raitasuo, S., & Lonnqvist, J. (2001). Suicide mortality in mental retardation: A thirty-five year follow-up study. *Acta Psychiatrica Scandinavica, 103,* 307–311.

Ryder, K., Williams, J., Womack, C., Nyak, N., Nasef, S., Bush, A., Tylavsky, F., & Carbone, L. (2003). Appendicular fractures: A significant problem among institutionalized adults with developmental disabilities. *American Journal on Mental Retardation, 108,* 340–346.

Sherrard, J., Ozanne-Smith, J., & Staines, C. (2004). Prevention of unintentional injury to people with intellectual disability: A review of the evidence. *Journal of Intellectual Disability Research, 48,* 639–645.

Sherrard, J., Tonge, B., & Ozanne-Smith, J. (2001a). Injury in young people with intellectual disability: Descriptive epidemiology. *Injury Prevention, 7,* 56–61.

Sherrard, J., Tonge, B., & Ozanne-Smith, J. (2001b). Recall bias in injury studies of young people with intellectual disability. *Injury Control and Safety Promotion, 8,* 83–89.

Sherrard, J., Tonge, B., & Ozanne-Smith, J. (2002). Injury risk in young people with intellectual disability. *Journal of Intellectual Disability Research, 46,* 6–16.

Slayter-Hernández, E., & Krauss, M. (2003, November 19). *Establishing a baseline: Substance abuse among Medicaid beneficiaries with intellectual disability.* Paper presented at the annual meeting of the American Public Health Association, San Francisco.

Spreat, S., & Baker-Potts, J. (1983). Patterns of injury in institutionalized mentally retarded residents. *Mental Retardation, 21,* 23–29.

Tannenbaum, T., Lipworth, L., & Baker, S. (1989). Risk of fractures in an intermediate care facility for persons with mental retardation. *American Journal on Mental Retardation, 93,* 444–451.

Vig, S., & Kaminer, R. (2002). Maltreatment and developmental disabilities in children. *Journal of Developmental and Physical Disabilities, 14,* 371–386.

Wang, D., McDermott, S., & Sease, T. (2002). Analysis of hospital use for injury among individuals with mental retardation. *Injury Control and Safety Promotion*, 9, 107–111.
Whiting, S. (2002). Obesity is not protective for bones in childhood and adolescence. *Nutritional Review*, 60, 27–30.
World Health Organization. (1999). *International classification of diseases, ninth revision, clinical modification*. Geneva: Author.

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Appendix A Summary State Sample Selection Statistics

		Youth with MR				Youth without MR		
State	All youth	*n*	%	*n* treated	% treated	*n*	*n* treated	% treated
Alaska	37,152	82	0.2	40	48.8	37,070	10,473	28.3
Alabama	271,103	1,096	0.4	383	34.9	270,007	69,173	25.6
Arkansas	197,608	3,162	1.6	1,096	34.7	194,446	51,334	26.4
California	2,579,499	11,706	0.5	3,989	34.1	2,567,793	415,015	16.2
Florida	493,805	990	0.2	594	60.0	492,815	125,453	25.5
Georgia	402,281	1,613	0.4	581	36.0	400,668	115,504	28.8
Indiana	296,228	1,416	0.5	679	48.0	294,812	81,760	27.7
Kansas	104,364	1,187	1.1	468	39.4	103,177	30,176	29.2
Kentucky	151,575	584	0.4	316	54.1	150,991	65,066	43.1
Louisiana	278,663	1,718	0.6	663	38.6	276,945	79,564	28.7
Massachusetts	283,782	556	0.2	228	41.0	283,226	84,580	29.9
Maryland	250,777	3,020	1.2	724	24.0	247,757	44,510	18.0
Maine	70,587	1,163	1.7	573	49.3	69,424	29,225	42.1
Missouri	369,865	2,170	0.6	777	35.8	367,695	96,891	26.4
Mississippi	227,410	2,038	0.9	731	35.9	225,372	61,529	27.3
Montana	25,592	193	0.8	111	57.5	25,399	11,188	44.0
North Carolina	476,876	4,807	1.0	1,536	32.0	472,069	129,893	27.5
North Dakota	21,687	125	0.6	66	52.8	21,562	7,946	36.9
New Jersey	340,393	2,082	0.6	709	34.1	338,311	63,982	18.9

(Appendix continues)

Appendix A Continued

		Youth with MR				Youth without MR		
State	All youth	*n*	%	*n* treated	% treated	*n*	*n* treated	% treated
New Mexico	134,738	139	0.1	66	47.5	134,599	31,954	23.7
New York	582,718	3,694	0.6	1,203	32.6	579,024	102,632	17.7
Ohio	360,763	2,326	0.7	1,211	52.1	358,437	125,547	35.0
Oklahoma	205,265	1,362	0.7	471	34.6	203,903	45,347	22.2
Oregon	167,533	1,081	0.7	365	33.8	166,452	42,366	25.5
South Dakota	26,606	52	0.2	39	75.0	26,554	9,650	36.3
West Virginia	99,274	1,413	1.4	725	51.3	97,861	47,743	48.8
Total	8,456,144	49,775	0.6	18,344	36.9	8,406,369	1,978,501	23.5

