

# Overview of the Reporting Sources of Developmentally-delayed Children in Taiwan Between 2011 and 2012

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## Abstract

Early Intervention (EI) services, as defined in The Bye-laws of Children and Youth Welfare Law, provided for 1.2 % of the nation's infants, toddlers and preschool children between 2011 and 2012; however, the proportion was higher in some counties or cities and lower in others. In order to elucidate factors that may influence reporting rates, we analyzed the reporting sources from 23 counties/cities between 2011 and 2012. We analyzed registry data of newly reported cases between 2011 and 2012, published by the Department of Statistics, Ministry of Interior of Taiwan. The reporting sources were categorized into eight types, and the percentage of cases reported by each source was calculated. The statistical relationship between these variables and the reporting rates were analyzed with suitable methods. P value < 0.05 was regarded as statistically significant. The estimated 2-year average reporting rate of new cases was 11.97%. The reporting rate was significantly higher among children living in counties compared with children living in cities ( $P = 0.0007$ ). The reporting rate was also significantly higher among children living in low urbanized areas as compared with children living in highly urbanized areas ( $P = 0.0067$ ). The proportion of medical organization reported cases was the highest of all the reporting sources

(39.99%). Higher reporting rates from householders, guardians and health centers positively affected the total reporting rates ( $P = 0.0499$  and  $P=0.0151$ , respectively).

In conclusion our study shows that many sources contribute to the notification of children at risk or with developmental delay, with implications for regular surveillance and screening children development by people involved with them. Incorporating more efficient developmental screening tools, including parent-concerned based screening questionnaires during health screening, with additional staff to do the screening, may increase the proportion of children with possible developmental delay being notified.

**Keywords** : Reporting, developmental delay, Taiwan

## Introduction

Developmental problems are a common issue among children. The reported prevalence of developmental problems or developmental disabilities ranged from 14% to 17% (Montes et al., 2012; Boyle et al., 1994; Newacheck et al., 1998). Children with disabilities or showing persistent delays can impact the family in different ways and different levels (Boyle et al., 1994; Boulet et al., 2009). However, research has demonstrated that

children with developmental delays, who receive either Early Intervention (EI) services at a younger age or more intensive intervention, were associated with increased school readiness skills, and better health, educational and social outcomes in the long term (Palfrey et al., 2005; Reynolds et al., 2014; Reynolds et al., 2011). Therefore, early identification of children at risk of developmental delay is one of the essential components for successful EI. In Taiwan, EI services, as defined in The Bye-laws of Children and Youth Welfare Law, include the provision of necessary treatment, education, counseling, transfer to an appropriate institution, placement and other services and care, according to the individual needs of children under six with developmental delay and their families, through collaboration of multidisciplinary teams in social welfare, health, and education. Eligible children are those who have been evaluated by a health ministry accredited multidisciplinary medical team, and showed delayed cognitive development, physiological development, language and communication development, psycho-social development or self-governing skills. There is no standard definition of developmental delay. In Taiwan, most EI professionals adopted -1.5 SD below the mean in any norm referenced developmental test as the numerical criteria for EI eligibility. According to the probability calculation published previously, adopting this numerical eligibility definition would have >20% children candidates qualified for EI services (Rosenberg et al., 2013a). There are limited studies on the prevalence of developmental delay in Taiwan. The estimated prevalence of children with developmental delay based on registration data of the EI notification system between 2003 and 2008 was 8.6-16.6 per 1000 under 3 years of age and 26.2-47.6 per 1000 at 3-5 years of age (Lai et al., 2011). This data suggests that for infants, toddlers and preschoolers, the reported prevalence rates are lower than data reported from other countries,

and that the proportion served in EI is much less than the proportion of candidates (Rosenberg et al., 2013b). Effective developmental screening efforts, relevant informatics reporting and documentation, completed developmental evaluation and service referrals may affect the outcomes of EI. However, to identify all children with developmental problems, both timely and accurately, is one of the major challenges for implementing EI programs in Taiwan. Our recent study shows that the EI program served 1.2 % of children under 7 years old between 2007 and 2012, but some counties or cities had higher rates, while others had lower rates (Kang et al., 2014).

## Objectives

In order to elucidate factors that may influence reporting rates, we analyzed registry data of newly reported cases between 2011 and 2012, published by the Department of Statistics, Ministry of Interior of Taiwan.

## Methods

### Materials

We analyzed the registry data of newly reported cases between 2011 and 2012, published by the Department of Statistics, Ministry of Interior of Taiwan (Ministry of Interior of Taiwan, (TAIWAN),” 2013.). The information used in this study included reporting areas (city/county) and sources.

The reporting rate (‰) of each city (county) was estimated using age (under the age of 7) - and ethnicity-specific children in each year in the database obtained from the Ministry of Interior as the denominator. The reporting sources are categorized into eight types, which are: 1, householders and guardians; 2, nursery service organizations; 3, early intervention center organizations; 4, social welfare organizations; 5, kindergartens; 6, medical organizations; 7, health centers; and 8, other. We also categorized the community into high or low urbanization levels.

In the urbanization classification system applied to this study, low urbanization communities shared the characteristics of low population densities, low percentages of residents with college or higher education, and low numbers of physicians per 100 000 people, suggesting that the residents in these areas tended to have a lower social economic status than their counterparts in more urbanized areas (Liu et al., 2006). We used the t test, simple regression by stepwise approach, or multiple regression analysis to analyze whether factors, such as localities and urbanization levels of a city/county and reporting source, were associated with a higher reporting rate. P value < 0.05 was regarded as statistically significant. The study was exempted from review by the Joint Institutional Review Board of Taipei Medical University.

## Results

The estimated 2-year average reporting rates of new cases was 11.97%. Table 1 shows the prevalence and percentage of cases reported from the 8 sources in 23 counties/cities between 2011 and 2012. Figure 1 shows the prevalence of developmental delayed cases reported from cities or counties. The reporting rate was significantly higher among children living in counties compared with children living in cities (P = 0.0007). Figure 2 shows the prevalence of developmental delayed cases reported from high or low urbanized

areas. The reporting rate also was significantly higher among children living in low urbanized areas compared with children living in high urbanized areas (P = 0.0067). Figure 3 shows the average proportion of cases reported from each reporting source. The proportion of medical organization reported cases was highest among all the reporting sources (39.99%). The case proportions reported by the other sources, in descending order, were as follows: social welfare organizations (15.49%), health centers (12.30%), householders and guardians (9.16%), other (8.60%), kindergartens (7.93%), nursery service organizations (4.23%), early intervention organizations (2.31%). In simple regression analysis, higher reporting rates from householders and guardians, and health centers, positively affect the total reporting rates (P = 0.0499 and P=0.0151, respectively). In multiple regression analysis, the coefficient of determination (R squared) was 0.6348 for predicting reporting rates from urbanization levels, locality, reporting sources 1 (householders and guardians) and 7 (health centers)(P=0.0012). The equation generated, which describes the statistical relationship between urbanization levels, locality, reporting sources from householders and guardians and health centers and the reporting rates, is as follows:  $Y=13.21434-0.24901 \text{ source } 1(\text{householders and guardians}) + 0.14799 \text{ source } 7(\text{health centers}) + 2.35863 \text{ county} + 4.52412 \text{ low urbanization}$ .

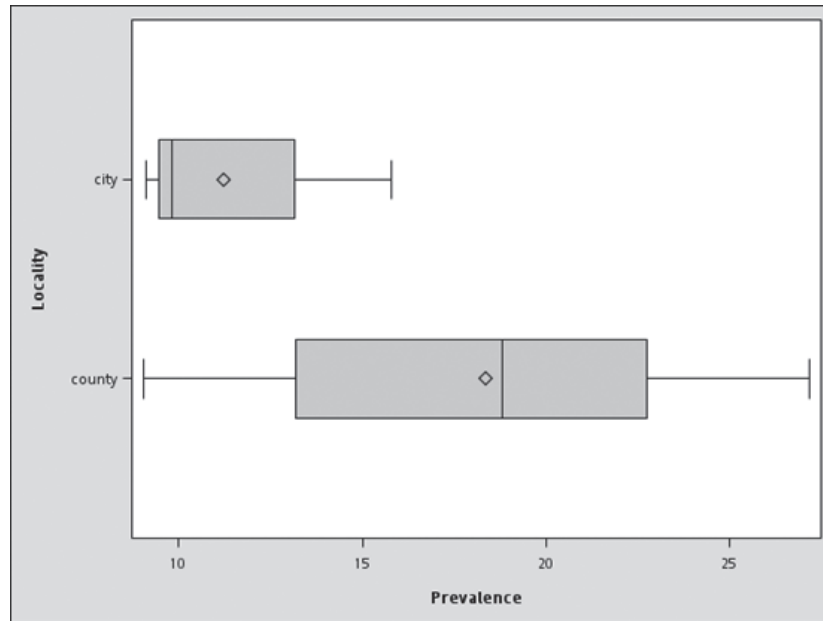
**Table 1:** The average prevalence of developmental delayed children and the percentage of cases reported from the 8 sources in 23 counties/cities between 2011 and 2012.

	Prevalence (%)	Source 1 (%)	Source 2 (%)	Source 3 (%)	Source 4 (%)	Source 5 (%)	Source 6 (%)	Source 7 (%)	Source 8 (%)
<b>Total</b>	<b>11.97</b>	<b>9.16</b>	<b>4.23</b>	<b>2.31</b>	<b>15.49</b>	<b>7.93</b>	<b>39.99</b>	<b>12.30</b>	<b>8.60</b>
New Taipei City	9.51	3.52	2.69	1.27	2.83	1.57	50.84	12.34	24.95
Taipei City	9.45	7.98	1.04	0.00	27.07	7.79	55.65	0.09	0.38
Taichung City	9.48	20.23	3.19	0.12	18.02	14.68	33.90	3.32	6.54
Tainan City	9.12	12.92	1.68	2.36	16.65	2.21	50.21	7.67	6.30
Kaohsiung City	10.1	11.45	2.89	12.39	16.58	5.06	45.94	3.28	2.40
Yilan County	18.56	2.38	9.97	1.63	6.61	2.49	63.71	5.53	7.69
Taoyuan County	11.09	6.01	2.80	0.00	37.34	1.77	47.45	3.67	0.97
Hsinchu County	9.03	14.73	3.65	0.41	17.43	9.19	50.14	3.51	0.95
Miaoli County	19.02	6.10	7.32	0.08	13.73	26.85	37.91	7.48	0.53
Changhua County <sup>#</sup>	22.74	2.50	5.05	4.44	4.88	1.22	1.80	50.58	29.53
Nantou County <sup>#</sup>	20.07	15.78	12.81	0.00	13.74	18.66	17.73	21.26	0.00
Yunlin County <sup>#</sup>	15.3	16.28	6.12	0.84	16.78	5.03	38.93	14.51	1.51
Chiayi County <sup>#</sup>	13.18	20.88	14.16	0.44	13.58	10.22	21.61	16.79	2.34
Pingtung County <sup>#</sup>	11.82	4.04	7.47	5.35	9.89	5.35	56.51	9.18	2.22
Taitung County <sup>#</sup>	24.57	1.75	2.23	1.12	15.79	17.38	29.67	29.98	2.07
Hualien County <sup>#</sup>	21.99	3.22	9.41	0.12	13.86	10.15	56.44	6.44	0.37
Penghu County <sup>#</sup>	27.17	3.58	1.08	1.43	49.10	0.72	19.00	24.01	1.08
Keelung City	15.79	6.42	2.75	1.47	5.32	3.85	53.03	19.82	7.34
Hsinchu City	14.14	11.19	3.23	0.10	8.77	38.61	33.57	0.20	4.33
Chiayi City	12.16	22.97	2.43	0.27	18.65	18.92	26.22	8.11	2.43
Kinmen County <sup>#</sup>	17.37	29.36	6.81	5.96	2.13	20.00	25.11	8.94	1.70
Lienchiang County <sup>#</sup>	25.18	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00

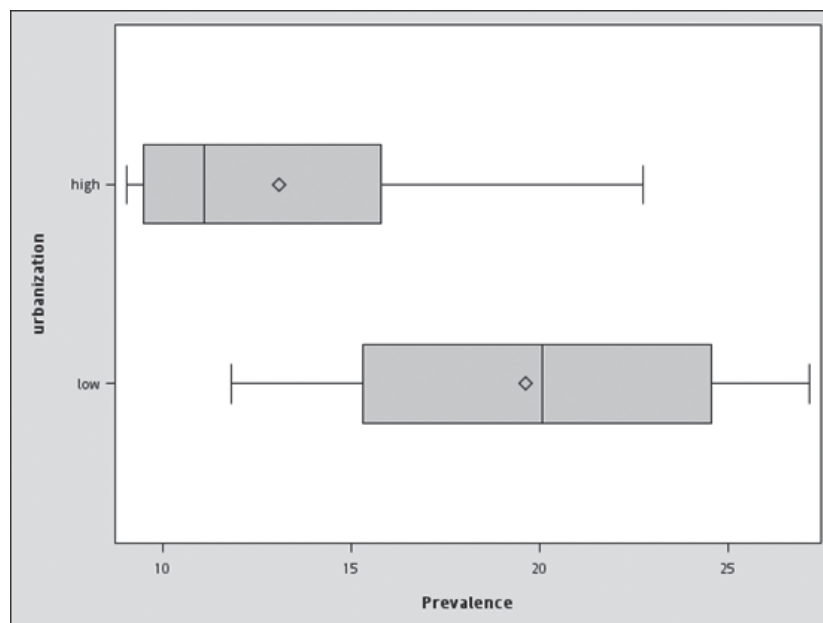
County<sup>#</sup>

Source 1, householders and guardians; Source 2, nursery service organizations; Source 3, early intervention center organizations; Source 4, social welfare organizations; Source 5, kindergartens; Source 6, medical organizations; Source 7, health centers; Source 8, other <sup>#</sup>, low urbanization

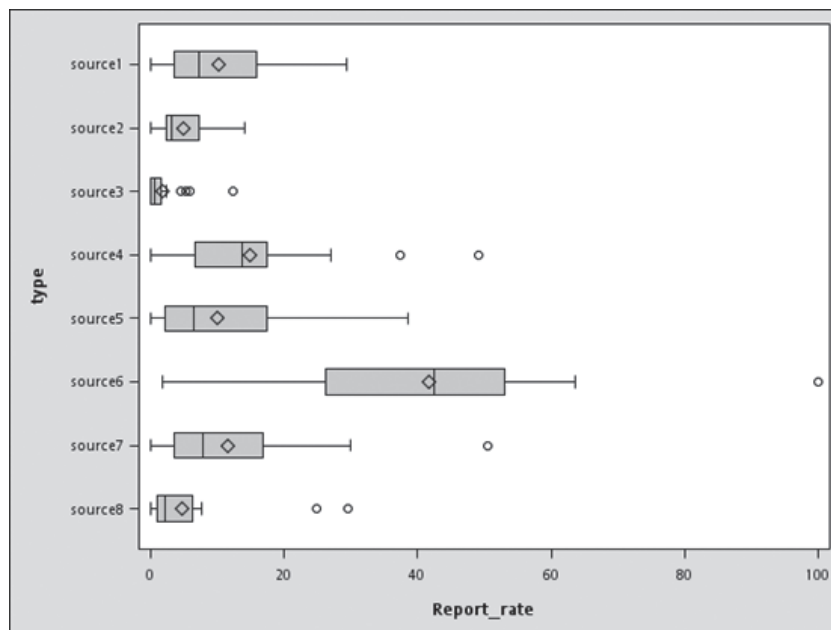
**Figure 1:** Box plot of the prevalence (%) of reported children at risk or with developmental delay in Taiwan, 2011-2012, by locality (city or county). The plot shows the mean (line within the box), 25<sup>th</sup>- and 75<sup>th</sup>-percentile (boundaries of the box), and median (diamond within the box).



**Figure 2:** Box plot of the prevalence (%) of reported children at risk or with developmental delay in Taiwan, 2011-2012, by localities' urbanization levels. The plot shows the mean (line within the box), 25<sup>th</sup>- and 75<sup>th</sup>-percentile (boundaries of the box), and median (diamond within the box).



**Figure 3:** Box plot of the average percentage (%) of reported children at risk or with developmental delay in Taiwan, 2011-2012, from each reporting source. Source 1, householders and guardians; source 2, nursery service organizations; source 3, early intervention center organizations; source 4, social welfare organizations; source 5, kindergartens; source 6, medical organizations; source 7, health centers; and source 8, other. The plot shows the mean (line within the box), 25<sup>th</sup>- and 75<sup>th</sup>-percentile (boundaries of the box), and median (diamond within the box).



## Discussion

The investment put into EI provides economic returns that exceed costs (Reynolds et al., 2008; Palfrey et al., 1987). However, despite the high prevalence of developmental problems in young children, early identification of children eligible for EI and complete service referral remains difficult (Rosenberg et al., 2008; Sayal et al., 2004). Our study shows that many sources contribute to the notification of children at risk of, or with, developmental delay, with the highest proportion coming from medical organizations. The percentage of cases reported from the 8 sources in 23 counties/cities between 2013 and 2014, in descending order, were as follows: medical organizations (38.47%), social welfare organizations (16.36%), kindergartens (12.88%), health centers (12.53%),

householders and guardians (9.18%), other (7.8%), early intervention organizations (1.88%), infant care centers (0.92%). The percentage of cases reported from kindergartens increased in the period between 2013 and 2014, but decreased from infant care centers, and householders and guardians, compared to the period between 2011 and 2012. The data showed that the proportion of medical organization reported cases was consistently highest among all of the reporting sources, suggesting that medical workers are a very important source of reporting eligible cases. Medical workers have the most opportunities to contact children in their early years of life rather than other EI professionals. However, the reported detection rate of children with developmental problems by clinical judgment

performed by medical doctors is low (Sayal et al., 2004). In recognition of both the importance of early identification of children with developmental problems, and improving the accuracy of identifying children with delay, the American Academy of Pediatrics (AAP) in 2006 revised the policy statement along with implementation strategies (Council on Children with Disabilities, 2006). The following US national survey that assessed the changes in pediatricians' developmental screening practices found that, despite the increased use of screening tools, still more than half of the respondents used clinical assessment, such as history and physical examination, without the use of a screening instrument/checklist (Sand et al., 2005; Radecki et al., 2011). Some of the main barriers in preventing the use of such tools included time limitations and lack of staff to perform screening (Sices et al., 2004). These results suggest that rapid and efficient screening tests should be developed and validated in order to meet the increasing emphasis on screening the pediatric population for developmental problems. In Taiwan, the Health Promotion Administration (HPA), Ministry of Health and Welfare subsidizes 7 free health screening services for children under the age of 7. Moreover, HPA authorized public health organizations to offer this service to preschool children, in order to raise the utilization rates to 85%. Since 2002, the utilization rate of this service has been maintained at about 70% ("Bureau Of Health Promotion Department Of Health, R.O.C. (TAIWAN)," 2014). Widely incorporating efficient developmental screening tools, such as the Taipei City Developmental Checklist for Preschoolers, 2<sup>nd</sup> version (Taipei II) during health screening services, along with additional staff to do the screening, may have contributed to the increased reporting rates of children with possible developmental delay between 2007 and 2012 (Liao et al., 2014; Kang et al., 2014).

Our study also suggests that higher reporting

rates from householders and guardians positively affect the total reporting rates. Parental concerns have been shown to be good predictors of children with developmental problems or delay. A previous study has shown that recognition of developmental problems by general practitioners increased significantly when concerns expressed by parents were taken into account (Sayal et al., 2004). However, not all parents are prepared to address problems they think their children are having, during short clinic visits, and not all general practitioners are trained to elicit useful parental concerns related to their children's development (Glascoe, F.P., 1994; Wissow et al., 1994). Parents' Evaluation of Developmental Status (PEDS), a parental concern questionnaire, and Ages & Stages Questionnaires (ASQ), a parental report of developmental skills, are two frequently used developmental screening tools (Radecki et al., 2011). Recent literature also supports screening for developmental delay with parent-completed tools (Glascoe, F.P., 2003; Limbos et al., 2011). The rationale behind this is probably because most parents know their child best, regardless of their education and income (Glascoe, F.P., 1994; Chen et al., 2004; Chung et al., 2010; Lung et al., 2010). Administration costs for parent based developmental screening are low, compared with the use of other medical resources (Sayal et al., 2004; Dobrez et al., 2001). Developing and incorporating a validated parental concern questionnaire or checklist during the office visit, may increase the proportion of reporting rates from householders and guardians in areas with a lower reporting rate.

After the enactment of the Child Welfare Law in 1993, integrated EI services, in collaboration with the health, social welfare, and educational sectors, began in Taiwan. In 1997, the amendment of the Special Education Law extended special preschool education to disabled children as young as 3 years of age; Since 1997, EI reporting and referral

centers began to set up in every county and city; The Child Welfare Bureau completed construction of the “individual cases management information system” for early intervention of children with developmental delay; The Department of Health implemented a management plan for screening children with developmental delay and tracing suspected individual cases in 2004 (Huang PH, 2007). The above developments have together increased the total number of children with developmental delay receiving EI services annually (Kang et al., 2014). As it is compulsory to report to authorities when social welfare, educational

and medical institutes find any developmentally delayed children (Article 32 of the Protection of Children and Youths Welfare and Rights Act), regular surveillance and screening of children’s development by health workers, caregivers, social workers and preschool teachers working with high risk families, as well as incorporating more efficient developmental screening tools including parent-concerned based screening questionnaires during health screening, along with additional staff to do the screening, may further increase the number of children identified with developmental delay.



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