

Longer Runway: Economic Analysis of the Post-Secondary Education and Training Options for
Youth with Developmental Delays

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1. Introduction

Young adults with developmental delays (DD) face substantial barriers to participation in modern labor markets; with participation rates that are lower than the general population of same age adults with other disabilities. Currently, youth with developmental delays are able to receive some transition services and vocational training, albeit in limited quantities while in the secondary school system and through IDEA funded programs, until the age of 21. The only available track for the youth with developmental delays of ages 22 through 26 is to pursue some type of vocational training, provided through each state's Vocational Rehabilitation (VR) services. However, the success rate of placing these young adults into meaningful employment remains low as many of the VR clients end up in center-based facilities. Besides, a number of these young adults are willing to pursue post-secondary education (PSE) as an alternative to or in concert with vocational training, but face limited options for pursuing an academic track.

This limitation prevents young adults with developmental delays from being able to participate in the modern labor market and also makes it impossible for the labor market to utilize the special skills that some adults with DD can supply, such as high attention to detail, high quality outcomes and high job loyalty (Cowen, 2011; Nesbitt, 2000).

In particular, the subgroup of young adults with Autism Spectrum Disorder (ASD) can offer particularly unique and desirable characteristics to the labor market. There are examples from the private sector, including Ken's Krew (a program by Home Depot and CVS), Walgreens Experiment, and some international experiences in hiring individuals with autism for technology jobs, that indicate that there is willingness to hire and demand for such workers, especially with projected decreases in future entrants into the labor force (Cowen, 2011; Bergman, 2010).

According to recent estimates by the Center for Disease Control (CDC), 1 in 88 children in the US is diagnosed with some form of ASD, which represents a 23% increase from 2009¹. However, while the number of youth with this and other developmental disabilities is growing, their prospects beyond a secondary education have not been given proportional attention. In fact, a thorough search of the scholarly literature on programs for youth with ASD found little beyond some early childhood interventions, K-12 special education programs, and transition programs funded through IDEA.² Post IDEA options for youth with developmental disabilities seem to be extremely sparse. A few small scale programs exist, but they have not been evaluated rigorously, thus the potential for bringing these to scale is currently not well understood.

¹ <http://www.cdc.gov/Features/CountingAutism/>

² IDEA stands for the Individuals with Disabilities Education Act; it has mandates to provide education based on secondary schools for youth with disabilities until the age of 21.

Moreover, with the current estimate that 80% of individuals diagnosed with ASD are under the age of 18³, the next few years will see a disproportionate number of young adults with ASD potentially entering the workforce. These youth face substantial barriers to postsecondary education and workforce participation. Recent nationally representative estimates show that more than 50% of youth with ASD had no participation in employment or education in the first few years following exit from high school. Youth with ASD also had the lowest rates of participation in employment and the highest rates of non-participation in further education or training compared with youth in other disability categories (Shattuck et al., 2012). At the same time, with the retirement of Baby Boomers, the labor force needs to expand in order to fill the demand for workers that retired individuals will likely generate, as well as to maintain a feasible balance between revenues and expenses in the public sector.

Labor force shortages are particularly pronounced in Science, Technology, Engineering and Mathematics (STEM) occupations (Stine, 2009). At the same time, multiple studies find that young adults with ASD show high technical abilities that lead them to participate disproportionately in STEM occupations. For instance, rates of autism among offspring or relatives of adults in STEM fields are found to be higher than among the general population (Baron-Cohen et al. 1997, 1998; Jarrold and Routh 1998; Wheelwright and Baron-Cohen 2001). Also, a population-based study of the San Francisco Bay Area suggests that maternal STEM careers were associated with a higher prevalence of offspring with autism (Windham et al. 2009).

A recent study using nationally representative data from the National Longitudinal Transition Study-2 (NLTS-2) finds that youth with autism were much more likely to participate in STEM occupations than their peers with other disabilities and those among the general population of same-age youth without disabilities. Yet, the study finds youth with Autism to have some of the lowest rates of participation in postsecondary education (Wei, Xin et al, 2012).

The authors go on to conclude that *“In an era where a world-class science and engineering workforce is needed to remain competitive in a technologically advancing global economy, it becomes imperative to discover previously untapped sources of STEM talent. This study confirms that individuals with an ASD may indeed have the potential to become such a resource. The implications from these findings also support previous research indicating that postsecondary educational institutions need to provide extra supports and services for students with autism to complete their college degrees and navigate toward STEM careers.”* (Wei, Xin et al, 2012).

PSE options for youth with ASD are sparse. But even to the extent that they exist, their effectiveness in raising employment has not been evaluated rigorously. There is some descriptive evidence that college-based inclusion programs targeted at youth with Autism have beneficial

³ Autism Speaks Official Blog, entry from October 12, 2011.

outcomes (Zager and Alpern, 2010); a few studies also conduct an assessment of the benefits of Vocational Rehabilitation (VR) programs related to employment outcomes. However, most of these studies do not take into account statistical issues that arise in the evaluation of educational and training programs in the absence of randomized-control experiments (Card, 1999; Dean et al., 2001), including the evaluation of VR and other programs for the individuals with disabilities (Dean, 1991).

As noted, at a time when labor shortages are forecasted with a particularly high need for new workers in the STEM fields, an increasing numbers of youth with ASD are reaching working age and they display unique talents. Yet these youth face very high barriers to PSE training and successful employment. Thus, there is a high need for effective programs that facilitate the transition of youth with an ASD from school to work. This may particularly be the case for programs that are able to pick up where secondary-school IDEA-funded transition programs end.

Successful social programs are difficult to design and evaluate due to a myriad of practical and statistical obstacles. As is the case with almost all educational and training programs for any population, the best way to design and implement successful efforts is by taking advantage of learning through trial and error, based on innovative pilot programs. The primary purpose of this paper is to summarize the literature that evaluates the effectiveness of programs aimed at facilitating the school-to-work transition of youth with ASD and to provide an *ex-ante* economic impact analysis of potential innovative pilot programs.

This paper makes the following points:

- a. We argue that the need for pilot programs that facilitate PSE and labor force participation of youth with ASD beyond the age of 21 far outpaces their availability.
- b. We estimate social costs and benefits from increased labor force participation of youth with ASD and use the findings to estimate minimal success rates that programs would need in order to generate a net gain to society.
- c. We conduct a critical review of the literature on program evaluation as it relates to other types of programs for youth with disabilities for the purpose of assessing if the required program success rates that we estimate are feasible.
- d. We find that the necessary minimal success rates are modest and achievable and, therefore, recommend increased focus on the design and evaluation of pilot programs intended to facilitate PSE attainment and labor force participation in skilled employment for youth with ASD.

Most importantly, this paper presents an economic analysis of potential PSE/training pilot programs for young adults with ASD beyond the age of 21. This analysis quantifies the financial returns on investment to society from subsidizing this type of program for the population of

young adults unable to succeed in existing educational and VR settings and provides a preliminary analysis of the feasibility of programs able to generate net social gains.

We proceed as follows. The next section presents a brief literature review on the need for such programs, as well as some examples of existing programs and their effectiveness. Evaluation issues and the methodology used in the analysis are discussed in the following section. We then provide estimates of the social benefits and costs from increased employment opportunities for youth with ASD and estimate minimal success rates at which potential programs generate a net social gain. The final section provides an assessment of whether the required success rates are feasible, presents overall conclusions and a few notes on future research and program evaluation needs.

2. Importance of PSE/Training Options for Post-IDEA Young Adults with an ASD

Autism is recognized to be a “complex disorder” as well as “a spectrum of disorders” that includes Asperger’s syndrome and pervasive developmental disorders (Seltzer et al. 2004, p. 234). Recent estimates from the Department of Education show there were 200,000 students, ages 6 through 21 nationwide identified as having autism and receiving special education services under the Individuals with Disabilities Education Act (IDEA) (U.S. Department of Education 2006a). Despite an urgent and growing need, there is limited research on the transition of youth with ASD into PSE and vocational training that would prepare them for employment and there is nearly no empirical evidence on the success of programs specifically targeted at supporting young adults with ASD in the post-IDEA transition.

The traditional transition pathways for young adults with ASD after the age of 21 include participation in the state vocational rehabilitation services, which in most cases provide services that aim to place young adults into sheltered employment or facility-based work (Hendricks and Wehman, 2009). These types of employment categories are characterized by a high number of disabled individuals with continuous job-related supports and, sometimes, unpaid work (Migliore and Butterworth, 2008; Butterworth et al., 2011). This type of program is usually associated not only with high costs, but with low wages and continued dependency (Butterworth et al., 2011). In fact, center-based employment is no longer identified by many experts as a desirable RSA outcome (Winsor and Migliore, 2011).

The primary goal identified by both, students with ASD in their Individualized Plans for Employment (IPEs), and VR services is the transition into “meaningful” or “integrated” employment, with market-level wages (usually above the minimum wage) (Grigal et al., 2011; Butterworth et al., 2011). Despite these goals, young adults under 30 years of age with developmental disabilities have high rates of unemployment and, when employed, sub-minimum wages (Grigal et al., 2011; Shattuck et al., 2012).

Post-secondary education is also identified as a desirable outcome for young adults with ASD, but very few examples of existing programs or practices designed to facilitate participation in PSE are mentioned in the scholarly literature. This is somewhat anomalous since the elementary and secondary school systems are required by law to provide not only accommodations but also Individualized Educational Plans designed to improve the students' odds of success. Unlike laws for K-12 education, laws surrounding higher education are not set up to ensure individual success. They remove barriers preventing an individual from accessing an education; however, the nature of education itself is not changed in any way. As they transition from high school to college, in addition to changes in available educational support services, students may also have fewer available external services (Hewitt 2011).

There are many potential benefits to post-secondary education. For example, postsecondary training is a legitimate path to maximizing personal growth and educational potential for students with disabilities (Mazzotti et al., 2009). Also, as noted, higher PSE participation of youth with ASD is likely to result in higher participation in STEM occupations. These occupations are in high demand, yield higher returns than most other occupations and are particularly amenable for youth with ASD. Moreover, many of the students themselves include PSE in their transition goals on their IEPs (Individualized Employment Plan) that they prepare while in high-school (Smith et al., 2012; Grigal et al., 2011; Migliore and Lugas, 2011).

Perhaps the most important argument for increasing PSE opportunities for youth with ASD (and other developmental disabilities) is the relationship between college attendance and positive employment outcomes (Gilmore et al, 2001; Grigal, 2009, Migliore et al, 2009; Grigal et al., 2011). PSE can enable students to get jobs in the competitive markets, which is the primary objective of the transition services. It has been established in the economic literature that education actually increases skills and skill pays off in labor markets and other areas of life (Becker, 1964; 1993). There is abundant empirical evidence suggesting that education (for any group of individuals) improves labor market outcomes such as probability of employment, occupational standing and wages (e.g. Card, 1999).

Similar evidence has been found for the effect of education among youth with disabilities. PSE experiences have been correlated with increased wages and job opportunities in Carnevale and Derochers (2003), Marcotte et al (2005) and Prince and Jenkins (2005). Analysis of nationally representative data from the National Longitudinal Transition Survey 2 (NLTS-2) showed that the effect of PSE seems to be significant on the youth with ASD (Grigal et al., 2011). Students with disabilities who have participated in PSE are employed at double the rate of those with just high school diploma (Gilmore, Bose, Hart 2001).

In addition, options that combine PSE with enhanced job training can be particularly productive. Many PSE initiatives for students with ASD include a strong employment component (Briel & Getzel, 2009; Grigal, 2009; Neubert, Moon, & Grigal, 2002) so that students

can participate in career-related courses in order to gain critical work experiences, and ultimately, to secure competitive employment (Hart et al., 2010). Benz et al. (2000) summarize the literature on postsecondary outcomes and show that participation in vocational education, as well as, work experience are all among the factors that are correlated with improved outcomes.

While matriculation in the traditional post-secondary education institutions is not the only option to get youth into meaningful employment, it is likely an under-utilized option. State Vocational Rehabilitation services have had some success in providing services to adults with disabilities that would place them into competitive employment. For example, a 2010 Minnesota VR report documented that at the time when VR clients start receiving services the average wage of the clients was \$35/week, while at closure the average wages were \$321/week. The benefit-cost ratios for these services are likely high because of their effectiveness in reaching employment objectives for their clients (Dean et al., 2001; Nowalk, 1983; Dean et al., 2011).

Using the RSA 911 dataset, Smith and Lucas (2010) report that the number of youth with autism who participated in the VR services more than tripled between 2003 and 2008. However, they still constitute only a small number (3%) of all VR closures with an employment outcome, but overall, have a higher rehabilitation rate than youth with other disabilities (Grigal et al., 2011). The relatively low participation rates despite the higher odds of rehabilitation may be due to the fact that these services may not have many programs specifically targeted at young adults with autism and other developmental disabilities; the staff may therefore have little experience with this group, despite the increasing share of clients with ASD among the VR clientele (Grigal et al., 2011).

Vocational Rehabilitation services usually do not have a wide range of programs that offer support to clients to participate in PSE. However, when services that support transition into PSE for students with disabilities are available, this has been shown to enhance competitive employment outcomes and increase earnings (Migliore and Butterworth, 2008, Nowalk, 1983). Moreover, there is evidence that when students with disabilities participate in PSE, they are 26% more likely than those without PSE to exit VR programs with employment and earn 73% higher weekly income (Migliore and Butterworth, 2008). Conley (1989) showed that the probability of success of rehabilitation increases with levels of education. He also showed that annual increases in earnings are positively related to the number of years of formal education that a VR client has when he/she enters the program. This reflects not only the well-known positive relationship between education and wages in the general labor market, but also, the adaptability of more highly educated adults with disabilities to a higher order of training. These findings underscore the importance of including support for PSE as an essential component of programs assisting youth with disabilities in the labor force (including existing VR services and other existing rehabilitation services).

In addition to the education effects in the outcome of rehabilitation services, studies found that there are also age effects. Nowalk (1983) found that the cost-benefit ratios to VR services are higher for individuals of younger age. Conley et al. (1989) also found a negative effect of age on the earnings of VR clients. Butterworth et al. (2011), using the RSA 911 dataset, found that of all VR closures in 2009, an increasing percentage involved transition-age individuals (young adults between 16 and 26 years old at application) underscoring the importance of supporting a pathway to employment and a career at a critical life stage. These findings highlight the importance of focusing rehabilitation services on the younger clientele to get the largest return on investment. As noted, youth receive support through IDEA funded services until the age of 21, but the level of support declines sharply in the ensuing years (22-26).

Despite evidence that PSE can significantly improve outcomes for youth with ASD programs that target this transition for ages 22-26 are very rare. There are some examples in the literature of programs placing students with various disabilities into post-secondary institutions that were initiated as collaborative programs between states' educational authorities and 2- and 4-year colleges. However, most of these programs are still in the pilot stages. For instance, Grigal et al. (2011) report that in 2010 there were 27 model demonstration projects in 24 states that involved participation of students with intellectual disabilities (ID) in higher education. Pearman et al. (2004) also describe a collaborative program at a California community college that services 1,500 students with disabilities (between the ages of 18 to 22) where students received assistance with employment skills such as job coaching, participation in vocational training classes and paid work in local businesses or on campus. However, there are no formal evaluations of these programs and their effectiveness in placing students in competitive employment is not well understood, beyond some anecdotal evidence of client satisfaction.

While there are not many examples of programs that successfully transition post-IDEA youth with ASD into meaningful employment, there are indications that the private sector has a need and a niche for young adults with disabilities who have certain skills. For instance, Walgreens provides one of the better known examples of firms that have the experience of hiring individuals with disabilities at a disproportionate rate. This experience was acknowledged not only for being beneficial for the employees, but for the employers⁴. Ken's Krew, a program of Home Depot and CVS, provides vocational training for individuals with disabilities customized

⁴ While the program has not been rigorously evaluated, it has received positive reviews from various sources, including policymakers, media, organizations that work with disabled individuals, and the Walgreens employees (for example, see http://waysandmeans.house.gov/UploadedFiles/Russell_Testimony.pdf)

for various careers within the two companies⁵. However, as with the previous example, this program has not been formally evaluated either.

The growing information technology sector has also been identified as a potential job market for individuals with ASD because of their high attention to detail and ability to effectively work from home, which is becoming a trademark setting of this sector (Bergman, 2010; Cowen, 2011). Howlin et al. (2005) mention that individuals with ASD can get administrative, technical, computer-related, office-based, retail and catering/cleaning/factory work. Moreover, there are indications that many states, including Minnesota, will experience labor supply shortages in the coming years, which creates additional need for the infusion of young workers into the labor force (MN VR Report 2011). The need is particularly acute in the STEM occupations. Part of this need can be filled by training and preparing young adults with ASD for employment.

While traditionally youths with ASD have been underrepresented among the adult (ages 22 and above) VR clientele (Smith and Lucas, 2010) and thus not properly prepared for modern-day labor force participation, there is evidence that these young adults⁶ are willing and able to be trained. There is also evidence that the private sector is prepared to receive workforce from this segment of the population. Overall, we believe there is sufficient evidence supporting a growing need for PSE opportunities and transition services focused on preparing young adults with ASD above the age of 21 for meaningful employment. The major barrier towards such programs is likely due to the relative scarcity of evidence-based information on what types of programs might be effective.

Perhaps the best way to fill this evidence gap would be through the design and evaluation of innovative pilot programs that are specifically targeted to leverage the strengths of youth with an ASD. This study provides an ex-ante economic analysis of such programs to determine under what conditions these opportunities would generate social gains that exceed program costs. We then draw on existing literature on more general programs (e.g. VR) to assess if the design of new pilots is economically feasible.

3. Methodological issues

3.1 Cost-Benefit analysis from the perspective of welfare economics

⁵ www.kenskew.org

⁶ The literature points out that many of the students with ASD put “meaningful employment” and “PSE participation” as goals in their IEPs (Migliore and Lugas, 2011).

Cost-benefit analysis (CBA) of education and training programs has a long history in economics and has been used to analyze the economic benefits of such programs for both non-disabled and disabled individuals, including the benefits of PSE (Dickson and Harmon, 2011; Damon and Glewwe, 2011).

The cost-benefit analysis methodology is rooted in standard economic theory (for example, see Samuelson, 1954). The theory states that any new activity that generates a positive social surplus (benefits exceeding costs) has *the potential* to increase social welfare. If program costs exceed benefits, then the program is likely socially wasteful and should not be implemented. The difference between costs and benefits is, however, not the sole consideration in CBA. The distributional effects can be also examined after making a few assumptions on the properties of the underlying social welfare function (method for aggregating individual ‘utility’ or satisfaction to the society level) and on the parties who bear the costs and the ones who receive the benefits. In this study, we will presume that investments into new pilots will be undertaken by the public sector (through taxpayer dollars), thus we will provide separate accounts for benefits accruing to the government (which is the party that represents the taxpayers who are making the investments), and the program participants themselves.

3.2 Framework for the analysis

This study aims to evaluate the potential outcomes of a post-secondary education/vocational training pilot program for young adults with ASD ages 22 to 26. The main premise of the analysis is that such a program would increase social welfare by improving employment outcomes for young adults. Consider a hypothetical program (referred to here as the “Longer Runway” program) that aims to improve labor market outcomes for youth with ASD; we assume the program would be able to increase the probability of independent employment for a share of its participants. The point of this simulation is to compare two hypothetical “parallel universes”, one with and one without the program. We define the program’s success rate as the share of its participants who obtain meaningful employment, but that would, in the absence of the program, not have been able to do so.

The benefits of such a program then arise from the fact that these ‘marginal individuals’ (or induced workers) are now earning wages (reflective of the true productivity or benefit to the economy) and are relying less on social transfer programs (avoiding the use of resources typically associated with social transfers). The costs of such a program are mostly those of running the program for all participants (regardless of outcome). This setup already highlights the importance of the program’s ‘success rate’, as costs of running the program accrue for each participant, regardless of whether they secure employment or not, but benefits stem only from the successfully ‘induced’ jobs.

If such a program were in place, its evaluation would involve three components. First, private and social costs associated with employed and unemployed individuals need to be quantified; secondly, the costs of running the program for each individual would need to be quantified; and third, the success rates of the program need to be estimated in order to compute benefit cost ratios. Since we seek to provide ex-ante guidance on the feasibility of new pilots, we undertake the first two steps, but then estimate *minimal success rates required* for the program benefits to exceed costs.

The first known rigorous CBA of a training program for individuals with disabilities comes from Bellante (1972) who used data on VR programs in Florida for 1969. He measured social benefit as a difference between earnings of the rehabilitated clients at the time of acceptance into the program and earnings after the case closed, capitalized over the work-life of the client. For clients whose cases were closed as not rehabilitated, the difference between earnings at acceptance and earnings at closure was assumed to be zero. The costs were split into two parts. The first part, total vocational rehabilitation case service costs, is analogous to direct costs, in that a particular expenditure can be attributed to a particular client. The remaining costs (administrative, evaluation, counseling, and placement) are analogous to overhead costs and are averaged over the clients who participated.

The primary difficulty in all studies of this nature is to compute a reliable “success rate”, that is to determine how the observed outcomes of rehabilitated clients would be different had the program not been available. This issue arises because participation in the program and the timing and status of program exit are nonrandom; instead they are individual decisions that are based on each person’s circumstance. Non-experimental evaluation thus requires that the pre-to-post program outcome changes of those who were successfully rehabilitated (‘treated group’) be compared to others that did not participate in the program or dropped out (‘control group’). Non-experimental design makes it difficult to find a reliable “control group” that represents an accurate view of what outcomes for “the treated” would be in the absence of the program.

In the case of the “Longer Runway” program, there are no pilot studies that have generated data, making it impossible to compute a “success rate”. We, thus, approach the inquiry from a different angle; we compute social costs and benefits and ask, “What is the minimal rate of success that a program would have to obtain in order to generate a net social gain?” We structure our analysis in terms of the “representative program participant”--after calculating costs and benefits for this representative participant, we can compute the increase in the probability of employment for this participant needed to justify the cost of the program. In other words, this statistic tells us what percentage of the individuals eligible for the program have to find meaningful employment *because of the program* (whereas in its absence they would have not) for the program to “break even” (i.e. the benefits to be at least equal to or greater than the costs).

To compare the costs of a pilot program to its benefits, we need to account for both private benefits (i.e. accruing to an individual) and public benefits (i.e. accruing to society). Following existing studies that evaluate the economic benefits of education and training programs for disabled and non-disabled groups (Bellante, 1972; Conley, 1989; Nowalk, 1983; Damon and Glewwe, 2011), Table 1 presents the specific costs and benefits, private and public that will be considered in this analysis, by the party who receives the benefit or bears the cost. The analysis will focus on the state of Minnesota and the costs and benefits are calculated based on the data for this state, but they can easily be generalized to other settings.

Table 1: Allocation of costs and benefits from Longer Runway

	Participants	Taxpayers	Society
Costs			
Longer Runway program costs	0	-	-
Benefits			
Increased earnings	+	0	+
Increased tax contributions	-	+	0
Averted costs of public assistance transfers	0	+	+
Reduced administrative costs of public assistance	0	+	+

Notes: 0 indicates no costs or benefits, ‘-’ indicates a cost and ‘+’ indicates a benefit

4. Data Sources and Measures

4.1. Private benefits

Clearly, the primary private benefit results from improved labor market performance of the program participants themselves actualized in higher employment and earnings. Studies, however, also point to potentially substantial non-pecuniary benefits that an individual with

disabilities would get from being employed such as self-determination and confidence (Hart et al., 2010). These cannot be easily quantified so the analysis here will focus only on the monetary private benefits resulting from wages from employment in competitive markets, with the caution that these understate the true total benefit of the program. The analysis will consider single adults with ASD, ages 22 to 26, living with others (parents, guardians, etc.).

The first task is to obtain estimates of competitive market wages for individuals with ASD. However, unlike the returns to education or vocational training for non-disabled individuals, the returns for the individuals with ASD are not easily found in the literature or through data collected by federal and state agencies. When any such numbers are available, they are usually not disaggregated by separate disabilities so using the aggregated wage estimates may over or under estimate the effect of training programs on the wages of youths with autism and other developmental disabilities.

Another challenge for getting an estimate of wages is that we expect the wages to be higher after an individual goes through the additional education/training. One supposition we can make is that we expect this wage to be higher than the binding minimum wage, which is set at \$6.15 for 2012 in Minnesota⁷--because it is lower than the new federal minimum of \$7.25, the federal minimum wage rate is used in Minnesota as of July, 2009. The National Core Indicators website (a collaborative effort between the National Association of State Directors of Developmental Disability Services (NASDDDS) and the Human Services Research Institute (HSRI), with the goal of implementing a systematic approach to performance and outcome measurement for individuals with disabilities), shows that in the 25 participant states (Minnesota not included), 53 percent of individuals with disabilities earned less than the federal minimum wage⁸. However, it is unlikely that the average person represented in this data has undergone rigorous training. Thus, to get a better approximation of the wage after training, we need to use figures that reflect some form of training.

For the state of Minnesota, we find such wage figures in the Minnesota State Rehabilitation Council Annual Report from 2011. This report confirms the assumption that trainees, on average, earn more than minimum wage after participating in the programs (98 percent reported making higher than minimum wage after participating in the VR services). The average hourly wage for 2011 was \$11.23 without supports and \$9.08 with supports for program participants. Since both types of employment outcomes are possible outcomes for individuals with disabilities, the analysis will be done using the wages for both supported employment and integrated

⁷ Obtained from <http://www.dol.gov/whd/minwage/america.htm#Minnesota> (note that the minimum wage is \$5.25 for small employer (enterprise with annual receipts of less than \$625,000)). For the purposes of this analysis, we take the minimum wage of \$7.25 for larger enterprise.

⁸ <http://www.nationalcoreindicators.org/>

employment without supports.⁹ This will result in several estimates of the minimal success rate required for a socially beneficial program that range from the most optimistic (based on the assumption that all employment will be competitive) to the least (based on the assumption that all induced employment will be supported).

The findings from a 2009 analysis of the Rehabilitation Services Administration's 911 database confirm that people with ASD get higher average wages after completing VR programs (Cimera and Cowan, 2009), adding confidence in the assessment that the wage rate used in this study is a reasonable estimate.

As for the average hours worked per week, there are various numbers reported in the literature. For example, Migliore and Butterworth (2008) find (using the RSA 911 dataset) that the average individual among people in the integrated employment settings worked 27.4 hours per week. However, Cimera and Cowan (2009) show that, on average, employees with autism work fewer hours per week than individuals with other disabilities who have gone through VR services. The number they provide is 20.23 hours per week. Other studies mention a range between 19 to 33 mean hours worked by people with different disabilities post VR and other vocational training. This analysis will use 26 weekly hours work as the mean hours worked.

4.2 Public Benefits

The public benefits of educational/training programs for young adults with DD are any advantages that accrue to members of the society, in addition to the private benefits for the program recipients themselves. In the typical economic evaluation of educational programs, public benefits are also divided into income and non-income benefits. The income benefits are the spillover effects of higher wages and higher productivity. The non-income effects accrue due to reduced reliance on the welfare system, increased civic participation, reduced crime, and enhancement of social interactions (see a literature review in Damon and Glewwe, 2011). For the case of the individuals with disabilities, both the income and non-income effects mentioned above may accrue, but some are less applicable and/or relevant than others. In this effort, we focus attention on the averted costs of public assistance transfers that disabled individuals receive based on income qualifications (Howlin et al., 2005). Since these benefits result from

⁹ Studies indicate that although costs of supported employment are greater than benefits during the first years of implementation, costs decrease and benefits increase over time because employees increase both their hours and average hourly wages, while the amount of support needed on the job decreases (Conley et al., 1989). Therefore, employment with supports is considered as a desirable outcome for the post-training job placement.

means-tested programs, employment in competitive markets would substantially reduce the need for such transfers.

4.3 Monetary and In-kind Transfers to the Individuals with Disabilities

Adults with ASD and other developmental delays are usually officially designated as “disabled” before the age of 18 by the Social Security Administration. Therefore, they are automatically eligible to receive the federal Supplemental Security Income (SSI). Moreover, these costs are fairly significant for this age group--the GAO report found that SSI recipients tend to be younger, stay on SSI longer, receive larger benefit and depend on SSI as a primary source of income (Haveman et al., 2000).

For 2012, the maximal amount received by a single individual with disabilities living with others was \$494.34¹⁰, for an individual making less than \$1,010/month (i.e. not participating in “substantial and gainful employment”) and having liquid assets of less than \$2,000¹¹ in value. There are earned and unearned income exclusions, however, for the purpose of our analysis, we will use the maximum amount allowed, thus hypothesizing that the young adult with ASD that would be eligible for Longer Runway is likely not participating in substantial employment.

There are two things to note here. There are higher income exemptions for individuals with disabilities who are currently enrolled as full-time students that would still qualify them to receive the SSI transfers--these are not considered here since we are interested only in young adults that have completed educational/training programs such as the Longer Runway. Secondly, another payment that is sometimes received by individuals with disabilities that had been established before they turned 22 is the Social Security Disability Insurance (SSDI). This payment would be applicable to a very small group of young adults ages 22 to 26 with ASD (our target group) whose parents have died (and hence, the young adult can use their social security “credits”) or whose parents are receiving retirement or disability benefits. We will not consider this small group in this study.

The state of Minnesota provides a supplemental transfer (Minnesota Supplemental Aid---MSA) for adults ages 18 to 65 with disabilities who are already receiving SSI and have resources worth less than \$2,000. The amount received is calculated as the difference between the MSA standard and SSI payment. In 2012, the MSA standard for individuals living with others was

¹⁰ This calculation is done using the example from <http://www.ssa.gov/ssi/text-living-ussi.htm>

¹¹ All numbers are obtained from the Social Security Administration website: www.ssa.gov

\$558, which would mean an additional monthly transfer of \$63.66¹². Both the SSI and the MSA amounts are adjusted annually by the cost of living (COLA). While it is likely that these amounts will increase over time, it is difficult to predict this increase as it depends on the consumer price index, which in turn, may not change year to year for every year used in the analysis (e.g. no COLA adjustment was applied for 2011). Hence, we will use the numbers for 2012 in the net-present value calculation of benefits, which will result in more conservative figures for the public benefits.

In Minnesota, SSI recipients also automatically qualify for Food Support benefits (formerly Food Stamp Program), independent of gross income. While it is an in-kind benefit, its monetary value represents another potential averted cost. The amount of the benefit is calculated based on the number of people in the household. Assuming a single adult, the maximum amount is \$200 minus the amount of unearned income (SSI and MSA transfers) multiplied by 0.3. Thus, for an individual living with others, this amount is $200 - 558 * 0.3 = \$32.6$ ¹³.

4.4 Medical Assistance

Medical Assistance (MA) is Minnesota's version of Medicaid. To receive the MA benefit, an individual must be disabled with a monthly income of \$908 or less (a slightly lower income threshold than the SSI threshold). There is a monthly deductible of \$2.55. Section 1619(b) of the Social Security Act allows individuals receiving SSI to keep the MA coverage when their combined income is too high to get any SSI cash benefit. Under 1619(b), one can continue to receive Medical Assistance (MA) while earning up to \$50,846/year, provided that the total value of assets is less than \$2,000. Taking into the account the hourly wages of \$11.29 and \$9.08 that will be used in this analysis, an individual working at this hourly rate for 40 hours all 52 weeks of the year will not make above the amount specified under section 1619(b)¹⁴. Even though some of the "induced" employees are likely to select the employer's health plan and opt out of the MA coverage¹⁵ (or qualify for the MA coverage for employed persons with disabilities, MA-EPD, which has higher premiums), we will not take the MA costs into account since they may remain even after employment or may be transformed into other types of MA coverage.

¹² All information is obtained from
http://mn.db101.org/mn/programs/income_support/msa/program2a.htm

¹³ Information is obtained from
http://mn.db101.org/mn/programs/income_support/food_support/program2.htm

¹⁴ This information is obtained from
http://mn.db101.org/mn/programs/health_coverage/ma/program2a.htm

¹⁵ According to Butterworth et al. (2011), about 35% of VR graduates with employment enrolled in the employer-sponsored health plan.

4.5 Increased tax revenues

Even though the tax schedule may change over the 15 years taken as the length of post-Longer Runway employment, we assume a constant tax rate in this analysis. The approximate federal income tax for the income bracket of the participants earning the wage amounts considered in this analysis is 15 percent, while the state income tax is 5.35 percent. Note that for non-participants, any income received from public transfers is not taxed so the induced tax on earned income would represent a direct public benefit. Another direct public benefit comes from the increase in revenues from the sales taxes, assuming that the program participants would continue to spend the same proportion of their income on taxable consumer goods. Using the latest Consumer Expenditure Survey (BLS, 2010), consumers in the income bracket of the program graduates spend about 1.26 of their income on taxable goods, with the average sales tax for Minnesota being 6.875 percent.

4.6 Averted administrative costs

The last benefit considered in the analysis is the averted costs of administering public assistance programs (SSI, MA, etc). The literature estimates are around 10 percent of the total amount transferred (Lalonde, 1995; Bellante, 1972), which is the number used in this analysis.

Average discounted benefits

To calculate the net present value (NPV) of the benefits for the “representative program participant,” the following formula is used:

$$NPV = \frac{B}{(1+i)^t}$$

where B is the estimated average annual benefits (both public and private), i is the discount rate (3 percent and 5 percent will be used), and t is the projected length of employment. There is no consensus in the literature on the length of employment that young adults with ASD may have upon completing various training programs. Jacobson et al. (1988) state that the norm is to assume that individuals with disabilities would work until the age of 55. Cimera and Cowan (2009) give a more conservative estimate of 15 years of work for individuals with ASD after receiving VR services. This study will use the more conservative of the two numbers.

4.7 Program Costs

Costs for administering training programs for individuals with disabilities are almost exclusively public costs, as is the case with special education programs based at the school system and VR services. In order to compare this cost with the estimated per person benefits (in net present value), we need to calculate the average cost of the program per year. This figure is somewhat difficult to obtain because no such program has been carried out in Minnesota or elsewhere in the US. Programs such as Ken's Krew, as stated above, are structured differently than the proposed pilot program as they only provide 10- to 12-week, hands-on training for the specific job placements with Home Depot and CVS so their costs would not be comparable. The collaborative programs based at 2- and 4-year colleges, also mentioned above, do not have publicly available cost figures.

Since the Longer Runway pilot program being proposed is centered on the idea of some type of PSE (with elements of vocational training), one potential cost estimate can be inferred from the cost of special education (which includes vocational training). The latest number for the yearly cost of special education in Minnesota is for the 2006-2007 school year; the number reported is \$12,371 and includes only the additional services provided for students with disabilities, not the costs of the "regular" classroom instruction. While this figure is not disaggregated by the type of disability or the cost of specific activities included, we believe it to be a generous estimate of average costs for the Longer Runway program (providing conservative estimates for minimal success rate requirements). This figure may overestimate the cost of this type of a program since the typical VR costs are estimated to be between \$2,500-8,500 per client (Cimera and Cowan, 2009; Winsor and Smith, DATE; Dean et al., 2011; MN VR Report 2011). The VR costs reported in the studies are averages per completed cases, and the duration of the rehabilitation can range from several months to over a year. Even with adjustments for program duration, we believe the yearly cost of special education to be a generous approximation of the true average costs per client.

4.8 Program Size

This analysis is set up based on a "representative participant" model, and both costs and benefits are assumed to vary linearly with the number of participants. Therefore, the size of the program does not affect minimal success rate requirements (that can be expressed as either an increase in the probability of employment for the representative participant or the number of induced jobs per 100 participants). However, for purposes of exhibition, we provide a discussion of the likely number of the potential program participants. If the program were active in 2012, there would be approximately 727 young adults with ASD approaching age 22. According to MN Department of Education estimates, there were 60,586 high school graduates in Minnesota in 2008, which means that this cohort is 22 years of age in 2012 (i.e. has reached the post-IDEA age and is eligible for the adult VR and other adult services for individuals with disabilities). Among all

students enrolled in the MN school system, it is estimated that 1.2 percent are diagnosed with ASD (Chase et al, 2008). If the incidence of ASD among the 2008 graduating class is similar to the overall student population, there would be a universe of 727 individuals eligible for the Longer Runway program; a program that is able to matriculate half of the eligible population would have 364 participants. We synthesize costs and benefits for such a program although, as noted, minimal share requirements are not affected by program size in this analysis.

5. Results

Table 2 summarizes the costs and benefits of the Longer Runway pilot program. With a 3 percent discount rate and if all of the “induced” jobs were based on competitive markets without supports, the analysis shows that in order for benefits to be equal or to exceed costs a 4.12 percent induction rate is necessary (amounting to 15 program participants in our hypothetical program). If a higher discount rate of 5 percent is assumed, the necessary success rate would be 5.77 percent (21 program participants have to enter the workforce as a result of the program in our hypothetical example).

If all induced jobs were in supported employment, a success rate of 4.95 percent would be required with a 3 percent discount rate and a 6.6 percent induction rate would be needed if benefits were discounted at 5 percent per year; 18 individuals will have to enter the labor force with the induction rate of 4.95 percent for the 3 percent discount rate; for the 5 percent discount rate, 24 individuals will have to find employment, which gives an induction rate of about 6.59 percent.

Therefore, if future benefits are discounted at a 3 percent annual rate, for a program that is able to either induce nearly 5 out of 100 participants to obtain competitive employment, or 6.6 out of 100 participants to obtain supported employment, or some combination thereof, program benefits would cover costs. At the more conservative 5 percent discount rate, the program would have to induce 5 new competitive jobs, 7 supported jobs, or some combination thereof per 100 participants in order to cover its costs. We address the question of whether this seems like an achievable target in the next section.

Table 2: Results of cost benefit analysis (all numbers in US\$)

Type of employment	Without support	Without support	With supports	With supports
Discount rate	3%	5%	3%	5%

No. eligible participants	364	364	364	364
No. participants needed to “break even” (N)	15	21	18	24
<u>Costs</u>				
Cost of Longer Runway pilot program	4688609	4762835	4725722	4799948
<u>Income Benefits</u>				
Lifetime earnings by 1 participant	174282	130609	140916	105603
Lifetime earnings by N participants	2614233	2742782	2536482	2534483
<u>Averted costs</u>	-	-	-	-
Lifetime averted cost of public transfers for 1 person	84604	63403	84604	63403
Lifetime averted cost of public transfers for N people	1269067	1331470	1522880	1521680
Averted administrative costs	126907	133147	152288	152168
Total averted costs	1395974	1464617	1675168	1673848
<u>Tax benefits</u>				
Income tax benefit of inducing N people into employment	614345	644554	596073	595603

Sales tax benefit of inducing N people into employment	122833	128873	95270	95195
Total benefits of inducing N people into employment:	4747385	4980826	4902993	4899130
Percent of eligible needed to “break even”	4.12%	5.77%	4.95%	6.59%

6. Program Evaluation and Economic Feasibility of Pilot Programs

Undoubtedly, the best possible estimate of what an actual program success rate is likely to be would have to come from a randomized-control design pilot program. Recall that a success rate is defined as the additional number of program participants who are employed whereas in a hypothetical “parallel universe” where the program does not exist, they would not be. Of course, outcomes of program participants in the absence of the program cannot be observed, however, when the treatment and control group are simply chosen randomly, the control groups represents the counterfactual outcomes very well.

True randomized treatment-control designs are very rare in social science in general, perhaps reflecting both practical obstacles and ethical concerns with randomization. However, one such study that evaluates the effect of extending transition services after graduation exists, but it only applies to young adults aged 18-21. Izzo et al., (2000) evaluate a program that extends transition services post-graduation on a randomly selected subset of applicants (N=68) against a control group (N=32). The treatment group received some of the following services after graduation: vocational assessment, agency contacts (nearly 5.7 hours of interagency coordination services), IEP/Transition meetings, extended vocational training, Job Club, job interview assistance, job development and job coaching. The control group did not receive either of these through the program in question after the age of 18.

The treatment group showed significantly improved outcomes in earnings, employment and indicators of independent living. The study found employment rates among the control group that were similar to the rates in nationally representative data (e.g. NTLS2), while the rate of employment in the experimental group was between 10% and 20% higher. With minimal “break-even” requirements at that range between 4.12% and 7%, this study would imply between a 2:1 and a 4:1 benefit-cost ratio to society if a program were designed that can produce induction rates similar to the one examined in Izzo et al (2000); these are excellent rates of return on investment.

This was, however, the only example we found in the literature that examined the effects of extending transition services beyond graduation on labor market outcomes and it only applies to younger adults. Programs targeted at adults between the age of 22 and 26 may show different results.

A myriad of other studies provide mostly descriptive information that only show positive associations between service intensity and employment. Other experimental studies were also found, but the outcome was typically a test score (of a skill or attitude). We are unable to link these to employment. It must be noted that neither the services discussed here, nor the study was specifically tailored to youth with ASD. No examples of studies with an experimental design or rigorous non experimental efforts were found that inform on programs specifically designed for youth with ASD. For a recent systematic review of the overall literature on transition efforts during and shortly beyond secondary school see Cobb and Alwell (2009).

Programs that extend services beyond the age of 21 can perhaps provide a better comparison due to the age factor, however, all studies examining such programs are methodologically inferior to Izzo et al (2000), as they utilize secondary data.

We, therefore, turn to a brief critical review the current state of the literature on the evaluation of other programs intended for adults (22 years or older) with disabilities for further clues on whether our estimates of program effectiveness are feasible in a new pilot. In what follows, we describe study findings, but also discuss possible sources of bias.

While few examples of programs that offer PSE and other vocational training opportunities to young adults with ASD are beginning to appear, there have not been rigorous evaluations of their benefits to society. There are several studies that use qualitative methods to evaluate the outcomes of the existing transition programs (Butterworth et al., 2001); however, these results are often not generalizable to the larger population. There are other studies that use several available large sample datasets such as RSA 911 and NLTS-2 to evaluate various aspects of the transition process for young adults with disabilities, but their scope has mostly been descriptive.

It is well-established in the program evaluation literature that there are important econometric issues that can bias the results in the absence of experimental data (Imbens and Wooldridge, 2008; Card, 1999; Dean, 1991; Dean et al., 2011). The main issue that arises in the evaluation of educational and training programs (including VR programs) stems from the fact that proper treatment-control randomized experiments are not feasible for most social programs. As a result, evaluations have to rely on non-experimental data, which potentially suffer from the well-known “selection bias” issues (Rupp, Bell, and McManus, 1995). Program participation is a choice, rather than an assignment, and therefore, there may be unobservable characteristics of the program candidates themselves that could affect program participation, as well as, post training labor force outcomes. Studies that evaluate VR services basically reduce the empirical

problem to one of finding a reasonable control group to accurately represent what the outcomes of individuals rehabilitated by VR services would look like in the absence of the program.

Early estimates simply assumed that outcomes of participants at the point of program entry would remain constant in the absence of the program and considered any change in the outcomes of rehabilitated individuals to be a gain attributable to the program. The estimates of benefit cost ratios from these studies ranged from nearly 3:1 to as high as nearly 6:1. These estimates imply that programs have clearly exceeded required minimal success rates.

The issue with this method is that the circumstances of participants at the point of program entry may not provide a reasonable approximation of what their circumstances would be in the long run in the absence of the program. If individuals turn to VR when they experience deterioration in their circumstances, then the evaluation could over or under estimate program affects, depending on whether the deterioration triggering program entry was temporary or sustained. In the first case, the analysis would consider this abnormally disadvantageous situation to be the long-run “normal” in the absence of the program, while in reality this may have only been “a rough patch” and would overstate program effects. If the opposite were true and the trigger were indicative of a continuous deterioration in circumstances, the analysis would understate program effects (by assuming the baseline condition would remain constant instead of worsening).

Also, “positive self selection” is a distinct possibility; it represents the idea that individuals who have decided to make positive changes in their lives turn to VR as “part of the plan”. This would confound program effects with the effects of the “positive motivation” to join the program.

Many studies employed this assumption (using baseline conditions as a long-run control) until very recently. Dean et al. (2001) deal with this issue by using a quasi-experimental design using an internal comparison group, a sub-group that has had some exposure to the program but without receiving substantial treatment. This approach allows them to deal with potential problems of selection since the members of the internal comparison group have passed through the same self-selection screens as the treatment group, while not receiving the actual training.

Using longitudinal employment data from Virginia they show that for VR clients with mental illness who underwent training, the earnings over a five-year period were significantly higher than those who qualified but never participated in the program. The study finds a 1.6:1 benefit cost ratio for women and 3.5:1 for men with intellectual disabilities, both in excess of 1:1. These results, however, do not directly inform program

effects on employment, as they use earnings as an outcome. Total earnings could be affected by both higher employment rate and higher wages.

Perhaps the most relevant clue for our purposes comes from the latest evaluation by Dean and colleagues of the VR programs in Virginia. This study uses data on participation and employment outcomes for clients with mental illness from the Virginia VR services for years 1987-2007 and controls for selection issues arising from correlation between VR service provision and labor market outcomes using well established econometric methods. The effort examined VR effects on both, earnings and employment. The authors find that participation in training increased the propensity to find employment by 12.9% in the short run and 10.2% in the long run. They also find that the training component of the VR services had a strong positive effect on quarterly earnings (Dean et al., 2011).

The findings from the analysis of the Longer Runway program show that in order for the program to be justifiable economically, between 4.1-6.7% of eligible participants have to be employed (strictly as a result of the program) over the 15 years after completing the program, which seems feasible considering that the Longer Runway program would provide more comprehensive and tailored PSE and vocational training options than a typical VR setting. Dean et al. (2011) present evidence of success rates that are 2 to 3 times the minimal requirements that we compute. Consistently, their estimates of costs and benefits yield benefit to cost ratios between 2:1 and 3:1 from their most plausible estimates. Services designed to harness the unique set of skills that individuals with ASD possess are likely to produce success rates far in excess of those achieved by VR services.

7. Conclusions

We believe that the evidence presented in this paper indicates clearly that the development and rigorous evaluation of innovative pilot programs targeted to improve the labor market outcomes of youth with ASD between the ages of 22 and 26 present an opportunity to harness great social gains at a minimal to no risk. In particular, we highlight the following facts.

1-The number of youth with ASD who are reaching working age is increasing greatly, at a time when labor markets face the retirement of Baby Boomers. A larger labor force is needed to improve the number of those who pay taxes relative to net recipients, and successful programs accomplish both tasks; they reduce the need for social assistance and increase productivity among adults with ASD.

2-While labor shortages in general are forecasted, the needs appear particularly high in the STEM occupations. Youth with ASD gravitate towards STEM occupations at a much higher rate than peers with other disabilities and even peers with no disabilities, yet they face some of the lowest rates of PSE and labor force participation.

3-Our study conservatively estimates that programs which can induce between 4 and 7 jobs per 100 participants will pay for themselves. Both, experimental estimates for general programs among younger postsecondary youth with ASD (18-21) and non-experimental but rigorous estimates for older adults show induction rates that are anywhere between two and five times the minimal needed for any pilot to be a cost-neutral proposition.

Keeping in mind that the above are programs that are not specifically targeted for youth with ASD. Given the unique needs and talents of youth with ASD, well designed pilots likely have the potential to generate far larger gains than existing programs. We must also note that the risk is minimal; pilots would have to produce anywhere between ½ and 1/4th the induction rates of existing programs in order for them to impose more costs than benefits to society.

The population of individuals with ASD that are approaching adulthood is increasing rapidly, and the employment and earnings prospects for this group appear particularly bleak even in comparison to individuals with other disabilities. We assess that the availability of programs designed to support the transition of young adults with ASD into meaningful employment falls far short of demand for such services, particularly for youth that exit IDEA funded programs at the age of 21. The literature has shown a clear gap in the research and practice on the transition period of young adults with ASD after they leave the school system at the age of 21 and are absorbed by the adult rehabilitation services. These services are often not tailored to transition these young adults into meaningful employment by not providing PSE options or effective vocational training that would prepare them for today's jobs. The increasing number of young adults with ASD and the emerging trends in the job market indicate that there is an urgent need to create educational and training opportunities for this segment of the population, who otherwise would be unemployed, or underemployed, and dependent on public assistance transfers for their livelihoods.

Learning about how to design effective social programs for any population has to rely on well-evaluated pilot projects that implement innovative ideas, since large-scale experimentation with social programs is not possible. Such pilot programs targeted at post-IDEA age youth are very rare and not well evaluated, despite clear evidence that the private sector has independently (and for profit-driven reasons) taken an interest in utilizing the skills of individuals with ASD, and often so in semi- to high-skill technology jobs.

We, thus, propose that public support for such pilot projects is long overdue.

8. Caveats and future research

The challenging part of the analysis was the search for and identification of the relevant data needed for this analysis. There are few databases that contain current figures for young adults

with disabilities that are disaggregated by the type of disability, and more specifically, have a designated category for the autism spectrum disorder. With the growing number of children diagnosed with ASD, it is imperative that the data on these individuals is disaggregated from youth with mental and intellectual disabilities. This would enable policymakers and practitioners to commission empirical studies that would guide the design of policies and programs that can effectively target children and young adults with this disability. A program such as Longer Runway can be used not only as a platform that provides essential educational and training opportunities for the increasing number of young adults with ASD and facilitate their transition into meaningful employment, but also as a setting to collect panel data on the impact of these programs on the employment outcomes of the participants. The existence of such dataset would allow for a rigorous evaluation of program effects. Such study would not only contribute to the existing program evaluation literature, but also to the growing literature on the appropriate programs and policies for the growing number of the population with ASD.

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