

Short Report

RELATIONSHIP OF FERTILITY WITH INTELLIGENCE AND EDUCATION IN TAIWAN: A BRIEF REPORT

HSIN-YI CHEN*, YUNG-HUA CHEN†, YUNG-KUN LIAO‡
AND HSIN-PING CHEN§

**Department of Special Education, National Taiwan Normal University, Taipei, Taiwan, Republic of China*, †*Chinese Behavioral Science Corporation, Taiwan, Republic of China*, ‡*Department of Special Education, National Dong-Hwa University, Hualien, Taiwan, Republic of China* and §*Department of Economics, National Chengchi University, Taipei, Taiwan, Republic of China*

Summary. This study estimates the effect of dysgenic trends in Taiwan by exploring the relationships among intelligence, education and fertility. Based on a representative adult sample, education and intelligence were negatively correlated with the number of children born. These correlations were stronger for females. The decline of genotypic intelligence was estimated as 0.82 to 1.33 IQ points per generation for the Taiwanese population.

Intelligence is associated with many crucial factors in people's lives such as educational and occupational achievement and quality of life (Lynn & Vanhanen, 2006; Strenze, 2007; Judge *et al.*, 2010). Intelligence trends over time are the product of multiple factors that fluctuate over time, and therefore, should be closely monitored (Flynn & Weiss, 2007).

In 1984, Flynn examined eighteen US studies over a 46-year period from 1932 to 1978 and reported an average gain of 0.3 intelligence quotient (IQ) points per year (Flynn, 1984). International studies on increases in intelligence are consistent with Flynn's estimates. Flynn (2009) suggested that IQ gains will not continue indefinitely. Various trends across nations have been observed in the past 20 years. Data from the United States (Flynn & Weiss, 2007), the Commonwealth of Dominica (Meisenberg *et al.*, 2005, 2006), Germany and Korea have continued to show gains; however, static or declining trends have been observed in Great Britain, Denmark and other Scandinavian nations (Teasdale & Owen, 2000, 2005, 2008; Sundet *et al.*, 2004; Shayer *et al.*, 2007; Lynn, 2009; Shayer & Ginsberg, 2009). IQ has stopped increasing in many nations, raising concerns that the average intelligence of those populations will slowly decline (Lynn, 2011).

Table 1. Demographic characteristics of 73 Taiwanese aged 35–84 compared with Taiwan's population

	Taiwan population (%)	Sample (%)	χ^2
Sex			
Male	49	45.2	0.290
Female	51	54.8	
Years of education			
≥ 16	11.9	9.6	3.69
13–15	9.6	8.2	
12	22.8	23.3	
9–11	15.6	26.0	
≤ 8	40.2	32.9	
Region in Taiwan			
North	44.6	34.2	3.38
Central	24.3	22.8	
South	28.6	40.2	
East	2.5	2.7	

The majority of this research is from the United States, Great Britain and other countries in Europe, with contemporary data from Asia remaining limited. To better understand the trends of IQ development globally, studies from Eastern nations are necessary. Chen *et al.* (unpublished) recently reported a gain on the WISC of 2.45 full-scale IQ points per decade for children in Taiwan, and a smaller gain on the Wechsler Adult Intelligence Scale (WAIS, Third Edition, Wechsler, 2002) of 0.51 IQ full-scale points per decade for the adult population. It appears that IQ increases have become static in this country. This study evaluates the associations among fertility, intelligence and education, and estimates the effect of dysgenic trends in Taiwan.

Data from WAIS-III tests individually administered to a representative sample of the Taiwanese population were analysed to ensure reliable interpretations. Seventy-three Taiwanese people aged 35–84 years reporting no history of detrimental medical or psychiatric problems participated in this study. This sample was carefully selected to closely match the Taiwan 2010 census for demographics of sex, level of education and geographical regions. Table 1 shows non-significant differences in the demographics of this data set compared with those of Taiwan's population.

The Taiwan version of WAIS-III has eleven core subtests: Vocabulary, Similarities, Arithmetic, Digit Span, Information, Comprehension, Picture Completion, Coding, Block Design, Matrix Reasoning and Picture Arrangement. Internal consistency reliability is 0.98 for full-scale IQ (FSIQ; Wechsler, 2002). Correlation and part-correlation methodologies were used to investigate the association among FSIQ, education and self-reported number of children.

Intelligence and level of education attained were significantly and positively correlated ($r = 0.66$, $p < 0.001$, $df = 67$), as expected. The zero-order correlation between intelligence and the number of children was -0.27 ($p = 0.026$, $df = 65$). Correlation was -0.48 ($p < 0.001$, $df = 65$) between education and the number of children. Once

intelligence was controlled, the part correlation between education and the number of children remained statistically significant ($r = -0.42$, $p < 0.001$, $df = 64$).

The results also show that there has been greater dysgenic fertility for intelligence in women than among men. For women, the correlation between fertility and FSIQ was -0.35 ($p = 0.027$, $df = 37$). The correlation between fertility and education was -0.59 ($p < 0.001$, $df = 37$). When controlled for intelligence, the part correlation between education and the number of children remained significant at -0.52 ($p < 0.001$, $df = 36$). For men, all correlations were non-significant. The correlation between fertility and IQ was -0.18 ($p = 0.374$, $df = 26$). The correlation between fertility and education was -0.37 ($p = 0.057$, $df = 26$). The part-correlation between education and number of children was -0.33 ($p = 0.091$, $df = 25$) after controlling for intelligence. These relationships were considered zero.

Furthermore, the average number of children was 3.24 for adults with 8 years of education or less. This average dropped to 1.67 children for adults with 16 or more years of education. Similarly, the average number of children was 3.15 for adults with an FSIQ less than 84. This average dropped to 1.50 for adults with an FSIQ higher than 115. The fertility rate for the lowest FSIQ, or lowest years of education, was almost twice the rate reported for the highest FSIQ, or years of education. By weighting the IQ of the parents by their number of children and assuming that, on average, the mean IQ of the children is the same as that of their parents, the differences between the mean IQ of the sample and that of their children was estimated at a value between 1.15 and 1.87. If Jinks and Fulker's (1970) estimate of a narrow heritability of intelligence 0.71 is accepted, the decline of genotypic intelligence becomes 0.82 to 1.33 IQ points per generation for the Taiwanese population. The current findings are similar to the estimated 1 to 1.2 IQ points decline of genotypic intelligence reported in the United States (Meisenberg & Kaul, 2010; Lynn, 2011).

Taiwan is known to have a low birth rate, and fertility is continuing to decline. The fertility rate was 1.76 in 1996, and dropped to 0.91 in 2010 (Population Reference Bureau, 2012). Similar low fertility rates have been found in other East Asian countries such as Japan and Hong Kong. Professionals have recognized the seriousness of the effect of ageing on a society (Hsueh, 2003; Lam, 2009); however, like many other economically developed nations where the right of each person is equally valued, the issue of eugenics is a sensitive issue for discussion in Taiwan. Consequently, few studies have addressed the issues of dysgenic fertility. This study shows that higher educated and intelligent Taiwanese women are inclined to have fewer children. Furthermore, per generation, a 0.82 to 1.33 IQ point genotypic intelligence decline is currently occurring in Taiwan.

Lynn (2011) proposed the equation $IQ \times Conscientiousness \times Opportunity = Achievement$, stating that achievement is not only related to intelligence, but is also determined by opportunity and personality traits responsible for sustained work, self-discipline and the capacity to work toward long-term goals. The strong negative part-correlation raises concerns that not only do more intelligent and well-educated Taiwanese women have fewer children, but that women with a more achievement-oriented personality also have fewer children. These concerns merit further examination.

Consistent with the findings obtained by Lynn & Van Court (2004) and Meisenberg (2010), current results show that the dysgenic trend was much more pronounced in

women than in men. This could be because, in a more economically developed country, educated and intelligent women value self-actualization, and are likely to pursue careers over family responsibilities or raising children. Consequently, educated women may marry at an older age or remain single, thus having fewer children. Yi & Zhang (2010) found that a 1% increase in housing prices is significantly related to a 0.45% decrease in total fertility rates in Hong Kong. The economic developments in a country appear intertwined with education, intelligence and fertility.

Overall, the results reveal an inverse relationship among fertility, intelligence and education. This relationship was mainly noted in women. The results also suggest that genotypic intelligence is declining at a rate of 0.82 to 1.33 IQ points per generation in Taiwan. Dysgenic fertility has recently been documented in many Western countries. The current results provide supporting evidence in Taiwan.

References

- Flynn, J. R.** (1984) The mean IQ of Americans: massive gains 1932 to 1978. *Psychological Bulletin* **95**, 29–51.
- Flynn, J. R.** (2009) *What is Intelligence? Beyond the Flynn Effect*. Cambridge University Press.
- Flynn, J. R. & Weiss, L. G.** (2007) American IQ gains from 1932 to 2002: the WISC subtests and educational progress. *International Journal of Testing* **7**(2), 209–224.
- Hsueh, C. T. J.** (2003) Demographical trends and traits in Taiwan: a few implications for social welfare policy. *National Policy Quarterly* **2**(4), 1–22.
- Jinks, J. L. & Fulker, D. W.** (1970) Comparison of biometrical, genetic, MAVA, and classical approaches to the analysis of human behavior. *Psychological Bulletin* **73**, 311–349.
- Judge, T. A., Klinger, R. L. & Simon, L. S.** (2010) Time is on my side: time, general mental ability, human capital, and extrinsic career success. *Journal of Applied Psychology* **95**(1), 92–107.
- Lam, P. E.** (2009) Declined fertility rate in Japan: an aging crisis ahead. *East Asia* **26**, 177–90.
- Lynn, R.** (2009) Fluid intelligence but not vocabulary has increased in Britain, 1979–2008. *Intelligence* **37**, 249–255.
- Lynn, R.** (2011) *Dysgenic: Genetic Deterioration in Modern Populations* (2nd revised edition). Ulster Institute for Social Research, UK.
- Lynn, R. & Van Court, M.** (2004) New evidence for dysgenic fertility for intelligence in the United States. *Intelligence* **32**, 193–201.
- Lynn, R. & Vanhanen, T.** (2006) *IQ and Global Inequality*. Washington Summit Publishers, Augusta, GA.
- Meisenberg, G.** (2010) The reproduction of intelligence. *Intelligence* **38**, 220–230.
- Meisenberg, G. & Kaul, A.** (2010) Effects of sex, race, ethnicity, and marital status on the relationship between intelligence and fertility. *Mankind Quarterly* **50**, 151–187.
- Meisenberg, G., Lawless, E., Lambert, E. & Newton, A.** (2005) The Flynn effect in the Caribbean: generational change of cognitive test performance in Dominica. *Mankind Quarterly* **46**(1), 29–70.
- Meisenberg, G., Lawless, E., Lambert, E. & Newton, A.** (2006) Determinants of mental ability on a Caribbean island, and the mystery of the Flynn effect. *Mankind Quarterly* **46**(3), 273–312.
- Population Reference Bureau** (2012) *Fertility Rates for Low Birth Rate Countries*. URL: http://www.prb.org/pdf11/TFR_Table2011.pdf.
- Shayer, M. & Ginsburg, D.** (2009) Thirty years on – a large anti-Flynn effect? 11:13- and 14-year olds. Piagetian tests of formal operations norms 1976–2006/7. *British Journal of Educational Psychology* **79**, 409–418.

- Shayer, M., Ginsburg, D. & Coe, R.** (2007) Thirty years on – a large anti-Flynn effect? The piagetian test Volume & Heaviness norms 1975–2003. *British Journal of Educational Psychology* **77**, 25–41.
- Strenze, T.** (2007) Intelligence and socioeconomic success: a meta-analytic review of longitudinal research. *Intelligence* **35**, 401–426.
- Sundet, J. M., Barlaug, D. G. & Torjussen, T. M.** (2004) The end of the Flynn effect? A study of secular trends in mean intelligence test scores of Norwegian conscripts during half a century. *Intelligence* **32**, 349–362.
- Teasdale, T. W. & Owen, D. R.** (2000) Forty-year secular trends in cognitive abilities. *Intelligence* **28**, 115–120.
- Teasdale, T. W. & Owen, D. R.** (2005) A long-term rise and recent decline in intelligence test performance: the Flynn effect in reverse. *Personality and Individual Differences* **39**, 837–843.
- Teasdale, T. W. & Owen, D. R.** (2008) Secular declines in cognitive test scores: a reversal of the Flynn effect. *Intelligence* **36**, 121–126.
- Wechsler, D.** (2002) *Manual for the Wechsler Adult Intelligence Scale* (3rd edition, Taiwan Version). Chinese Behavioral Science Corporation, Taipei, Taiwan.
- Yi, J. & Zhang, J.** (2010) The effect of house price on fertility: evidence from Hong Kong. *Economic Inquiry* **48**(3), 635–650.