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/Kλy/l·⁄ă ōŜf2ø-replacement fertility and deterioration of the quality of demographic data

Recent level of fertility in China is a matter of considerable uncertainty and controversy

Since birth registration data are rarely used in demographic analysis, virtually no studies have evaluated the birth data from the various government departments

Few studies assessed the completeness of birth report in the population censuses

Using life table survival ratios to backward project 2000 age 0-10 population from 2010 census age data 10-20, education data and Hukou data

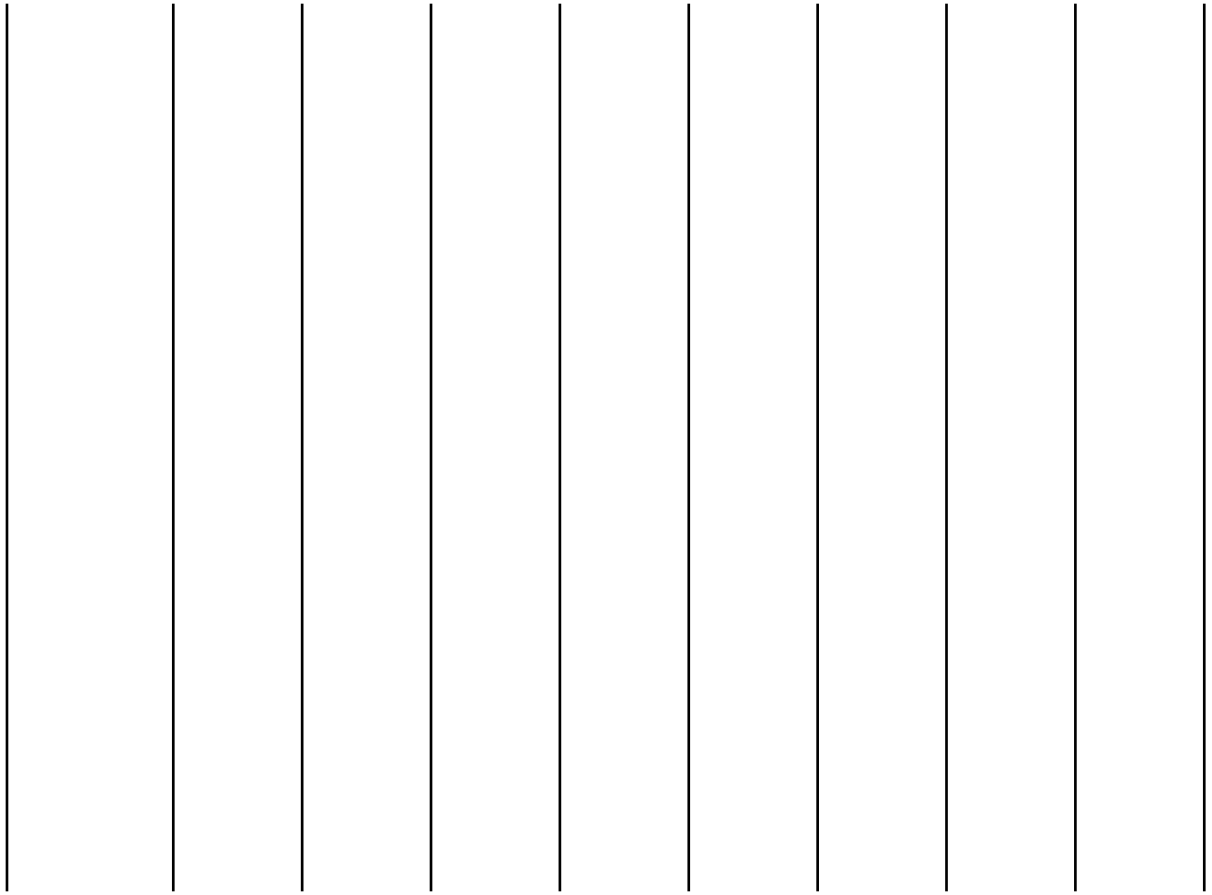
Calculating linear regression models of reported 2000 census age data 0-10 against the backward projected 2000 age data 0-10

Annual births in 2000-2009

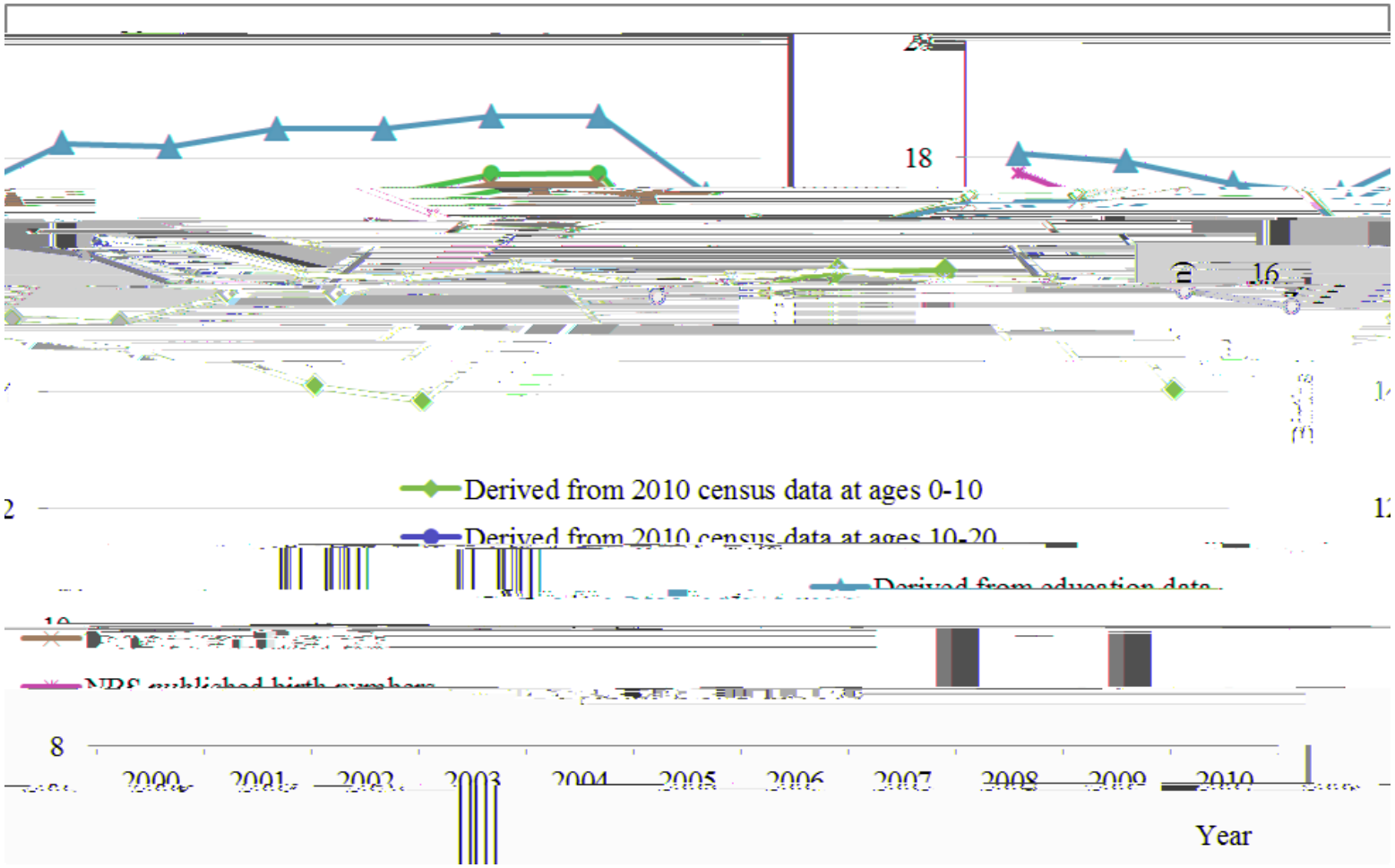
Plugging into the regression equations the reported 2010 census age data 0-10 to get the adjusted 2010 census age data 0-10

Using life table survival ratios to backward project annual number of births over 2000-2010 from the estimated 2010 age data 0-10

Annual births in 2000-2010



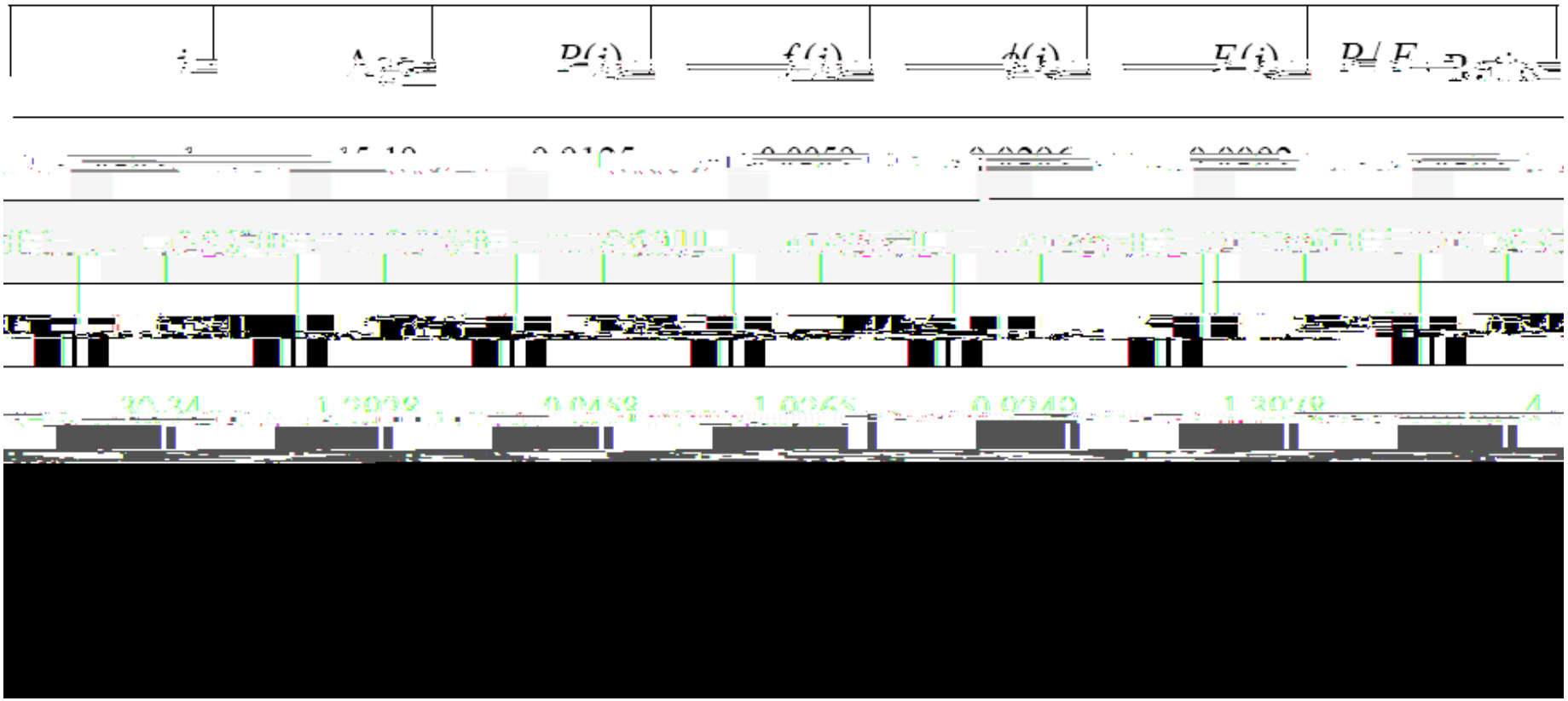
Annual births in 2000-2010



Using fertility data from the 2010 census and the P/F ratio method (Brass, 1967; United Nations, 1983)

Fertility data: age-specific fertility rates and average number of child ever born by age of mother

P/F ratio method to estimating births



$$F(i) \quad (i \quad 1) \quad a(i) f(i) \quad b(i) f(i \quad 1) \quad c(i) \quad (7)$$

Coefficients for converting into

i	Age	*a*	*b*	*c*
1	15-19	2.147	-0.244	0.0034
2	20-24	2.838	-0.758	0.0162
3	25-29	2.760	-0.594	0.0133
4	30-34	2.949	-0.566	0.0025
5	35-39	3.029	-0.823	0.0006
6	40-44	3.419		

Number of births in 2010

P/F ratios across 20-24 to 35-39 is roughly 1.4, implying that the period fertility in 2010 census is under-estimated by 40%

Adjusting the births from the 2010 census: 11.9 million is multiplied by 1.41, resulting an adjusted number of births of 16.78 million, implying a TFR of 1.66

Using age distribution data over age 10 from two censuses and generalized stable population models to estimate the average number of births between the two censuses

The integrated estimation method developed by Preston (1983)

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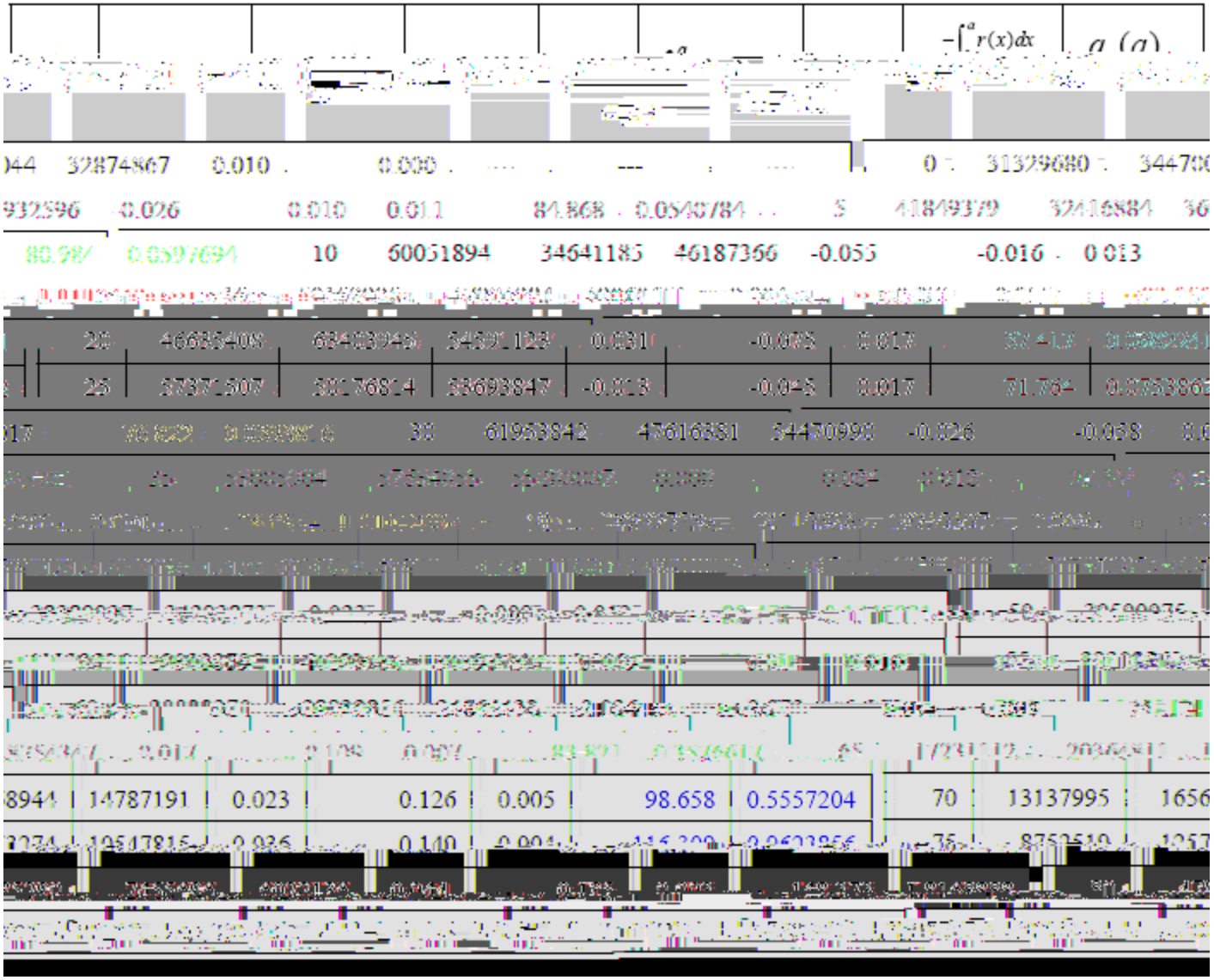
The integrated approach

$$\frac{e^{\int_0^a r(x)\,dx}}{c(a)} \quad \frac{1}{b} \quad \frac{k}{b}\frac{q_s(a)}{p_s(a)}$$

b is an estimate of the crude birth rate, and *k* adjusts the standard life table mortality curve to the level of mortality in the data of the population under study

The life tables of the 1982 census as the standard

Chinese female, 2000-2010



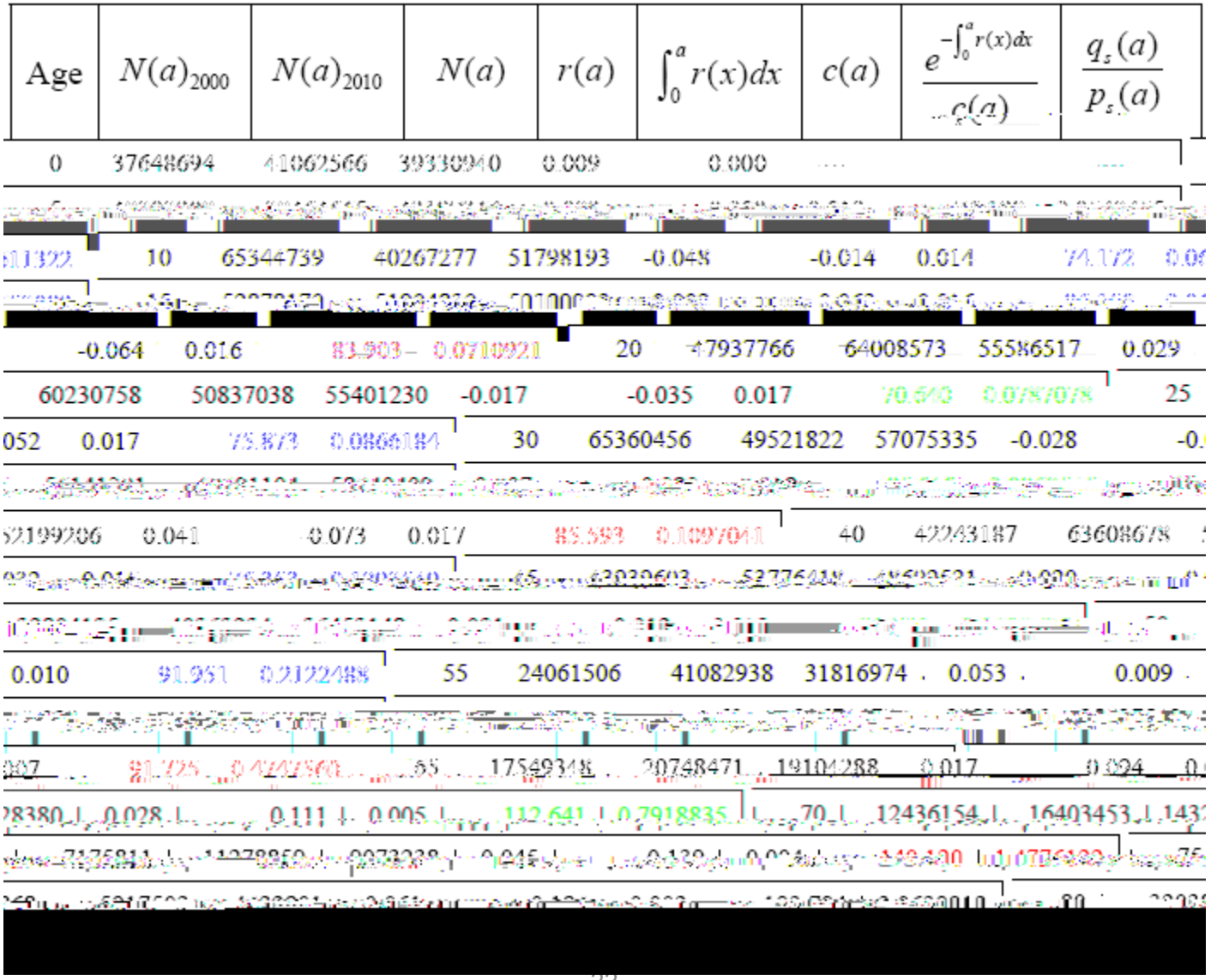
The female equation

$Y \quad 76.396 \quad 44.149X$, implying

$$b \quad \frac{1}{76.396} \quad 0.013090$$

$$k \quad \frac{44.149}{76.396} \quad 0.57790$$

Chinese male, 2000-2010



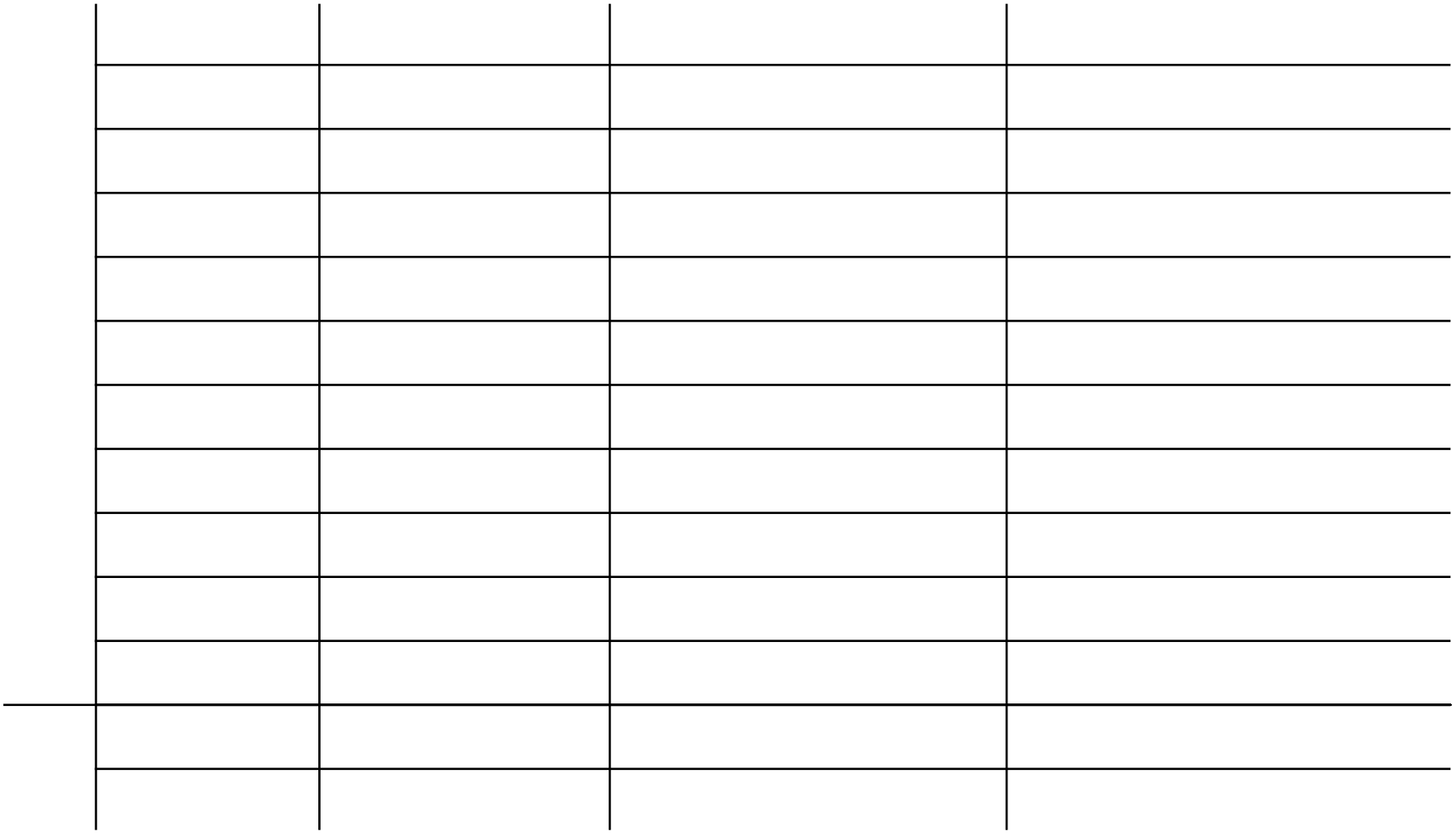
Inter-censal fertility derived from the integrated approach (comparison with NBS published estimates)

Fertility measure	1982-1990	1990-2000	2000-2010
Estimated crude birth rate	22.33	15.08	13.18
Published crude birth rate	21.58	17.25	12.50
Estimated births million	**23.78**	**17.80**	**16.88**
Published births million	23.09	20.67	16.27
Estimated total fertility rate	2.63	1.68	1.56

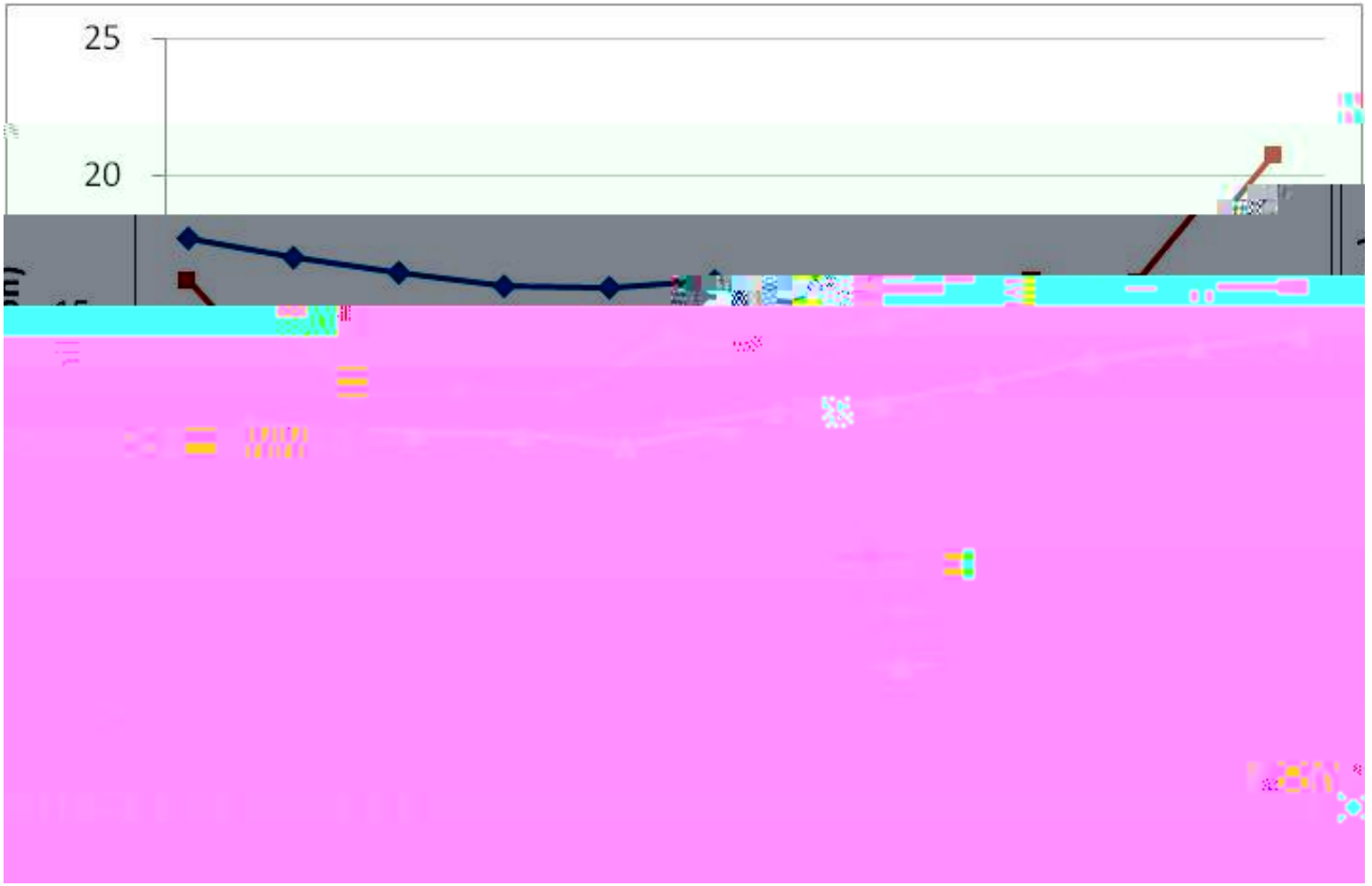
Estimated average number of births over 2000-2009 from the regression method

Sources of data	Row	Average over 2000-2009
Derived from 2010 census data at ages 0-10	(1)	15.15
Derived from 2010 census data at ages 10-20	(2)	16.79
Derived from education data	(3)	18.18
Derived from Hukou data	(4)	16.81
NBS published birth numbers	(5)	16.31
Average	(6)	16.65

Birth registration 2000-2010: various sources (million)



Birth registration 2000-2010: various sources



Judging by the result from the Preston integrated approach

- The NBS estimates are 96% complete
- Hukou registration data are 88% complete
- Hospitalized delivery data are 70% complete

Birth registration data are more complete in the late 2000s than in the early 2000s

- Different data and different methods have arrived largely consistent results
  - The average number of births over 2000-2010 stands at around 16.6-16.8 million
  - The average of the NBS-published annual estimates is only slightly lower than our estimate
- Referring to the results from this study, health department recorded nearly 90% while Hukou registration department only 70% of the births over 2000-2010

The integrated approach developed by Preston (1983) is more promising and of much higher application value than other two methods

- Population stability is a no more needed assumption, so is the assumption of population closed to migration
- Only population age distributions at two censuses are needed to estimate fertility and mortality
- Preston (1983) performed analysis of sensitivity to various forms of error, and it appears to provide a fairly robust estimate of fertility
- The relative coverage completeness of the two censuses rather than the absolute coverage completeness matters

Birth registration in China has been apparently affected by the one-child policy

- Millions of births or children, more female than

China adjusted the one-child policy and started to implement a two-child policy in 2016

- No more hiding is needed for second births
- The two-child policy is hoped to help improve quality of birth or population data in China