

Abstract

This report presents the evolution of census undertakings in China since 1953, with a focus on how the recently completed 2010 census differs from the 2000 census. How the censuses were conducted and what social and demographic information was collected *per se* to a large extent reflect the changing social and political situations in China over the past six decades. The report highlights the changes made since the 1982 census, especially the improvements of the 2000 census over the 1990 census and of the 2010 census over the 2000 census. Selected data are drawn from censuses to chart key aspects of social changes in China, including migration, urbanization and employment. Finally, problems encountered during the 2010 census undertaking and challenges for future censuses are identified and discussed.

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Introduction

Since the founding of the People's Republic of China, a total of six population censuses have been conducted in 1953, 1964, 1982, 1990, 2000, and 2010. How the censuses were conducted and what demographic information was collected *per se* to a large extent reflect the changing social and political situations in China over the past six decades. The first census in 1953, as a simple head count, collected information only on the respondent's name, age, sex, nationality, relationship to the household head, and whether the community he or she lived in was rural or urban. The second census in 1964 added education, occupation, and class status, but the results of the census were not officially publicized until the early 1980s (Aird 1982). With the assistance of various international organizations, including the United Nations Fund for Population Activities (UNFPA), China conducted the 1982 census, which has been lauded as being significantly more reliable, accurate, and thorough than the previous two censuses. In addition, the new census added items on household type, industry, and occupation for the working population, status of the non-working population (aged 15 or above), marital status, household registration and residence status, as well as items on fertility and mortality. Following the success of the 1982 census, the Chinese government has been regularizing the census once every ten years.

This article aims to document and analyze the Chinese experience with census implementation, and in particular, to compare the 2010 census with the 2000 census. It first presents an overview of the evolution of the six census undertakings in China since 1953 with respect to their organization, enumeration, items covered, and definition of certain key terms. It then highlights the major innovations and new features in the 2010 census undertaking, followed by in-depth analyses of selected issues, such as the changes in measures, the assessment of data quality, especially the underreporting of certain groups. Finally, the article identifies the problems and discusses the challenges for the 2020 census undertaking in an increasingly mobile and complex urban society.

A Brief Overview of Population Censuses in China, 1953-2010

It has always been a challenging task to enumerate the population in a vast and populous country like China. Despite its thousands of years of history, China had never conducted population census in the scientific sense until 1953, when the new communist regime, after two years of economic recovery, launched the first population census to collect information necessary for economic planning and social administration. The evolution of population censuses in China since then could be divided into three stages.

1. The Primitive Stage: The 1953 and 1964 Censuses

In the first stage, the 1953 and 1964 censuses were both conducted in a primitive mode, with July 1 as the reference date. To keep the enumeration simple, the 1953 census included only five items: name, sex, age, nationality, and relationship to household head, as well as whether the community was urban or rural. The 1964 census added education, occupation, and class status (*jieji chengfen*) (Aird 1982).¹ Even though the items included were very limited, the two censuses encountered obstacles. In 1953, before the installment of the household registration system (*hukou*), there was no distinction between permanent and temporary residents. The census included the population indirectly enumerated, including 11,743,220 overseas Chinese, 7,591,298 residing in Taiwan, and 8,397,477 residing in Tibet, the Qamdo and other remote regions (Editorial Office 1986). Apparently, it was difficult to reach the entire population even within the same territory. The organization of the first census also reflected the new regime's capacity for mass mobilization: representatives of each household were summoned by government staff to the registration stations and most arrived with written drafts of their answers to the census questionnaires, which were printed at their work units or in their communities. The fieldwork organization, enumeration procedures, and the methods of checking accuracy in 1964 were essentially the same as those employed in 1953.

The strong administrative support had ensured the data accuracy in census enumeration. The 1953 census undercounted the population by only 0.116 percent, with a double-count rate of 0.139 percent and an omission rate of 0.255 percent. The 1964 census had an even lower undercount rate of 0.0014 percent. While the undercount rates were lower than those in the developed countries such as the United States and Canada, western specialists in Chinese statistics and demography were often suspicious of the post-enumeration accuracy checks, because the areas that performed the checks, as they recalled, were not selected on a random basis, and the central census directives did not even provide a standard method of checking (Aird 1982, p371). As a result, the post-enumeration checks may not provide a true picture of accuracy. Analyses of other indicators suggested similar problems in the 1964 census (Aird 1982, p374).

Due to various reasons, the planning of the first two censuses lacked transparency in terms of designs and implementation, and the access to data was restricted to a large extent. For instance, the planning process of the 1953 census was not discussed in public until the promulgation of the Government Administration Council's census directives on April 6, 1953.

¹ Information on the last item was collected but not aggregated.

The approach to planning was a rather top-down administrative fiat without much technical consultation and empirical testing that is typically expected in a modern census undertaking. The implementation and the results of the 1964 census were not publicized and its very existence was even not officially acknowledged until the early 1980s. Moreover, the tabulated data released consisted of only limited information and micro-level data were not available, which meant that the use of census information gathered for planning and further research was much limited.

2. The Transition Stage: The 1982 and 1990 Censuses

Compared to the previous two censuses, the 1982 census marked a milestone in the development of the modern census undertaking in China. After the chaotic years of the Cultural Revolution, the economic reform launched by Deng Xiaoping in 1978 called for an accurate population count to be obtained for policy planning. Under the new open-door policy, the Chinese census planners seemed to be ready to adopt international practice and to accept assistance and advice from various organizations, including the United Nations Fund for Population Activities (UNFPA). The 1982 census, with the same reference date (July 1), was a far more ambitious project not only because the population had grown so much during the interim decades but also because more new items were added to the census forms. The household form included household type (domestic or collective), address, and other items such as the number of births and deaths, and the number of household members away for more than a year. The individual-level information collected included name, relationship to household head, sex, age, ethnicity, household registration status, education, employment status, industry and occupation for those aged 15 and above, marital status, children ever born and children surviving (for women aged 15 or above), and birth order in 1981.

While the previous two censuses relied on the hand tabulation methods, the vast amount of data collected in the 1982 census could not have been managed without employing automatic data processing equipment. It was the first time that the newly available computer technology was used in a census undertaking in China. Moreover, separate coding schemes were developed to categorize occupation and industry, which continue to be updated to this day. To ensure data accuracy, great efforts were made to develop and elaborate procedures, which were specified in the central directives (Aird 1982, p 373). The post-enumeration survey revealed a double-count rate of 0.071 percent and an omission rate of 0.056 percent, with a net error of 0.015 percent (Aird 1983, p614). More importantly, partly due to the confidence in data quality and partly due to the use of computer technology, the census results were published in detail and a 1% sample

of the micro-data was also made available to the public, even to researchers outside China.

The 1982 census is the first attempt to modernize China's large-scale population census, representing a major progress in the collection of demographic statistics in the country with far-reaching significance. Following the huge success of the 1982 census, the Chinese government has been regularizing the census once every ten years since 1990. This practice reflects the country's return to the normal social and political conditions after the chaotic years in the Cultural Revolution and the government's commitment to modernizing its statistical system.

The number of items in the 1990 census continued to expand in response to rapid social and economic changes. Unlike the 1982 census, in which the addresses were recorded in accordance with the hierarchy of China's administrative jurisdiction,² the fourth census adopted the concepts of census tracts and enumeration areas (*pucha qu* and *diaocha xiaoqu*, roughly equivalent to residents' committee and residents' group in urban areas and administrative village/villagers' group in rural areas, respectively). In addition to the highest level of education, the fourth census also added the current enrollment status to differentiate graduates from others. For employment status, the category "waiting for state job assignment" was dropped to reflect the transformation of the socialist employment system in 1990, and a new category "lost ability to work" was added. Population migration emerged in the mid-1980s as a new phenomenon with far-reaching social consequences, despite the persisting role of the household registration (*hukou*) system in restricting population migration to cities. Thus the 1990 census added several questions on migration. *Hukou* registration type (agricultural vs. non-agricultural) was specifically collected, given the increasing discrepancy between residence place and registration type. Those aged five or above were asked about both their permanent residence location and their residence type five years prior to the census (July 1, 1984), based on which migration status was defined. Those who had migrated were further asked about their reasons for migration (Wang 2000).

Notwithstanding the additional information collected, the 1990 census adopted the same enumeration criteria as the 1982 census: (1) a person who resides in the current location (a county or a city) and holds household registration there; (2) a person who has resided in the current location for one year or more but has household registration elsewhere (in a different

² The highest level of hierarchy was province/municipality/autonomous region, followed by county/city, commune/street committee, production brigade/resident's committee, production team, and residents' group. The commune, production brigade, and production team were abolished in the early 1980s after the introduction of the household responsibility system in rural areas.

county or city); (3) a person who has resided in the current location for less than a year but has left the place of household registration for more than a year; (4) a person who resides in the current location but has household registration pending; and (5) a person who used to reside in the location but does not hold the registration because he or she is in a foreign country (Wang 2000). This definition, however, fails to count short-term migrants who have resided in the current location for less than a year but kept their household registration in the original place of residence. Moreover, the migration questions in the 1990 census only distinguished mobility across county/city boundaries and circular migration within the five years before the census may have been omitted. These limitations became increasingly problematic given the acceleration of internal migration in the 1990s. A major revamp was thus necessary for the 2000 census.

3. The Modern Stage: The 2000 and 2010 Censuses

China underwent dramatic economic and social transformations in the 1990s between the fourth and fifth censuses. After the paramount leader Deng Xiaoping made his political tour to southern China in 1992 and called for further market reform, the private economy boomed and the state enterprises were fundamentally restructured, resulting in massive layoffs and rising unemployment in urban areas. Since the government's bureaucratic control over population migration and labor mobility was waning rapidly (Liang 2001; Liang and Ma 2004), geographic mobility became much easier than before, and out-migration to cities, especially from rural inland to coastal inter-provinces, prevailed from the late 1990s onwards. Moreover, the privatization of housing as an integral part of the market reform opened up a housing market and housing issues were a growing concern in China. The 1990s also witnessed a substantial expansion of educational opportunities in China, with the 9-year compulsory education largely fulfilled by the mid-1990s and the opening up of tertiary education in 1998 (Wu and Zhang 2010).

Given the increasing complexity of Chinese society on the one hand and the rising demand for social and demographic data to inform policy on the other hand, the fifth national population census in 2000, which differed substantially from the previous four censuses, was revised and expanded, laying down a new framework for the modern census undertakings in China. The new framework continued to be adopted in the 2010 census.

The 2000 census had several new features. On one hand, the questionnaires consist of both a short form and a long form—a practice that continued in the 2010 census. The short form covered the standard items, such as age, sex, nationality, registration status, registration type, and

educational level, whereas the long form was administered to 10 percent sample of the households in most provinces, with many additional items included. On the other hand, a new criterion was adopted to categorize registration status and define migration. The reference period was changed from one year in previous censuses to six months, placing more migrants at their current abode rather than at their place of *hukou* registration, although those away from their residence for less than the reference period were still uncounted. This new definition of migration duration also explains another instance of breaking away from tradition—the reference date of the 2000 census was November 1. Finally, while the 1990 census could only distinguish migration across county boundaries and in the five years before the census, the 2010 census was able to classify migrants with considerable spatial precision, helping to capture mobility across township/street committee boundaries (Lavelly 2001; Liang and Ma 2004).

There were two questions on education targeting those aged six years or older in the short form of the questionnaire: whether or not he or she was illiterate and his or her educational level. For educational level, a new item—“graduate student”—was added to reflect the expansion of higher education. The number of rooms in the house and the floor area also appeared as new items in the short form, but the long form contained 15 new items, covering the use and age of residence, construction materials, kitchen, fuel use, tap water, sanitary facilities, the source of housing, the purchase price or monthly rent, etc.

Indeed, the long form provided unprecedented scope for data collection. Items related to economic activity and unemployment were all relegated to the long form. In addition to the items about work status, industry and occupation that also appeared in previous censuses in 1982 and 1990, questions about work for pay in the week preceding the census, working hours, and source of support for those not working permitted a basic but systematic investigation of the labor force participation and employment/unemployment issues in the country. The enrollment status in the 1990 census was relegated to the long form, with an additional question on whether it is adult education for senior high school to 4 year college. Marital status collected in the 1990 census appeared in the long form only, with an additional question on the timing (age, year/month) of the first marriage.

The long form provided a rich source of social and demographic data for policy planning. In addition to the revised definitions of migration in the short form which enabled the government to chart mobility across township/street committee boundaries, the long form collected information on the birthplace, the location of last residence (county), and the year of last move, whereas the 1990 census revealed the mobility five years before the census (July 1,

1985). Despite the improvement, the newly added items pertaining to migration did not permit a full assessment of the floating population because those who have been away for less than six months were still counted at their *de jure* instead of *de facto* residence. Therefore, a portion of the floating population was not counted and their impact on urban destination was understated.

To remedy this problem, the 1% population sample survey in 2005 (known as a/the mini-census), as a pilot trial, was designed to capture the population at both their *de jure* and *de facto* residence on the reference date (12 midnight on November 1). In the sampled census tract, all Chinese citizens were asked whether they resided in the current residence or they were registered in the residence but lived else. This approach captured migrants in both origins and destinations, regardless of the duration away from their registration residence. In this case, the registered population, floating population, and residential population can all be calculated in different ways as needed (see the next section for more details). Another improvement in the mini-census was that it relied on the mapping of the residential community (census tract), on the basis of the fifth census, to help enumerate migrants, who may not have a regular place of abode. The 2005 mini-census made significant contributions to the 2010 census, representing a new stage of the census undertakings in China, thanks to the sophisticated designs, the utilization of new technology, and the mobilization capacity of the Chinese bureaucratic system (to be elaborated later) (National 1% Population Sample Survey under the State Council 2005).

Table 1 summarizes the evolution of the six population censuses. We can see that the reference time of census, the population coverage, the enumeration principles and the use of technology have substantially altered the features of the census undertakings in China, especially since 2000. Meanwhile, the items covered and the information collected have become increasingly sophisticated. As shown in Tables 2a and 2b, items in census questionnaires since 1982 (especially the long form) provide rich information such as housing, migration, employment, and regional development beyond the usual birth and death counts. In sum, the population census serves as an indispensable source of information for tracking the tremendous social and economic changes and informing the policy making in China.

In what follows, the innovations and new features in the 2010 census (the long form) are further elaborated, followed by a discussion on the problems and challenges encountered in the census, such as the under-enumeration, migration, and urbanization. Then the article briefly describes the changes in measures/definitions and how these changes could affect our understanding of the demographic, economic and social trends in contemporary China. Finally, suggestions for improving the census undertaking in the future are offered.

Table 1. Summary of the Evolution of China's Population Censuses, 1953-2010

	Primitive Stage		Transition Stage		Modern Stage	
	1953	1964	1982	1990	2000	2010
Std. reference time	12 midnight, Jul 1	12 midnight, Jul 1	12 midnight, Jul 1	12 midnight, Jul 1	12 midnight, Nov 1	12 midnight, Nov 1
Population size	582,603,417	694,581,759	1,008,175,288	1,133, 682, 501	1,265,825,048	1,339,724,852
Population coverage	Chinese citizens within territory	Chinese citizens within territory	Chinese citizens within territory	Chinese citizens within territory	Chinese citizens within territory	All natural persons within territory*
Enumeration principle	unclear	<i>hukou</i> registration	Regular residents as defined	Regular residents as defined	Regular residents as defined	Residence and <i>hukou</i> registration
Quality check %						
Over-count	0.139	0.0377	0.071			
Under-count	0.255	0.0391	0.056			
Net error	-0.116	-0.0014	0.015	1.75	1.81	0.12
Enumeration form	A single form	A single form	A single Form	A single form	A short form and a long form	A short form and a long form
New technology	Manual input tabulations	Manual input and tabulations	IBM computer system	Personal computers	Optical scanner for data input	Application of Remote sensing in census tract mapping
Address code	Unclear, at least rural and urban	Unclear, at least rural and urban	province, county/city, commune/street committee, production brigade/residents' committee, and production team/residents' group	province [omitted], county (city, district), township (town, street committee), census tract, enumeration areas	province [omitted], county (city, district), township (town, street committee), census tract, enumeration areas	province [omitted], county (city, district), township (town, street committee), census tract, enumeration areas, building #

*The number of alien population is not included in the total population size but is reported separately.

Table 2a. Summary of the Expansion of Items in China's Population Censuses, 1982-2010

Item	1982	1990	2000	2010
<u>Household level</u>				
Address	Yes	Yes	Yes	Yes
HH series #	II ¹	I	H1	H1
Type	I	II	H2	H2
# of members in the HH	III (# and # by sex)	III (# and # by sex)	H3 (# by sex)	H3 (# by sex)
Vital statistics				
# of births (period)	IV (# by sex) (1981)	IV (# by sex) (1989.1.1-6.30) (1989.7.1-12.31) (1990.1.1-6.30)	H7 (# by sex) (1999.11.1-2000.12.31)	H4 (# by sex) (2009.11.1-2010.10.31)
# of deaths (period)	V (# and # by sex) (1981)	V (# and # by sex) (1989.1.1-6.30) (1989.7.1-12.31) (1990.1.1-6.30)	H8 (# by sex) (1999.11.1-2000.12.31)	H4 (# by sex) (1999.11.1-2000.12.31)
Household members absent	VI (# and # by sex) (1 year above, cross-county/city)	VI (# and # by sex) (1 year above, cross- county/city)	H4 (# by sex) (Below 6 months, cross township/street committee) H5 (6 months or above, cross township/street co.)	H3 (in long form only): # living in the residence # registered in residence
Housing	-	-	H9 (# of rooms) H10 (area)	H6 (# of rooms) H5 (area)
<u>Individual level</u>				
Name	I	I	R1	R1
Relationship to HH head	II	II	R2	R2
Sex	III	III	R3	R3
Birth year and month	IV (plus birth date and age)	IV (plus age)	R4 (plus age)	R4
Ethnicity	V	V	R5	R5
Hukou registration status	VI	VI	R6	R6
Hukou registration type	-	VI	R7	R10

Education	VII (6 levels)	IX (7 levels, with specialized tertiary as a separate category, and enrollment status)	R8 (illiteracy) R9 (9 levels, with specialized secondary(<i>zhongzhuan</i>) and post-graduate as separate levels)	R11 (Illiteracy) R12 (7 levels)
Industry (age 15+)	VIII	X	Long form	Long form
Occupation (age 15+)	IX	XI	Long form	Long form
Status of non-working people (age15 +)	X	XII	Long form	Long form
Marital Status (age 15+)	XI	XIII	Long form	Long form
# Children ever born (women aged 15-64)	XII	XIV	Long form	Long form
# Children alive (women aged 15-64)	XII	XIV		
Childbearing status	XIII (age 15-49)	XV (age 15-50)	Long form	Long form
Residence 5 years ago (location/type/reasons for moving)		X	Long form	Long form

Notes: The Roman numerals represent the item label in the questionnaires in 1982 and 1990, whereas Hx and Rx stand for the labels of items for the households and individuals, respectively, in the questionnaires in 2000 and 2010 censuses.

Table 2b. Items Included in the Long Form: Comparisons of 2000 and 2010 Censuses

	2000	2010
Address		Building #
Household ID	H1	H1
Household type	H2	H2
# of people qualified for enumeration (by sex)	H3	H3
# of people away for less than 6 months (by sex)	H4	
# of people away for 6 months or above (by sex)	H5	
# of people away for less 6 months but within township and street committee (by sex)	H6	
# of births and deaths within a year, by sex	H7/H8	H4
Housing Conditions		
# of rooms	H9	H7
Floor area	H10	H6
Use	H11	H5
Building year	H13	H9
# of stories	H14	H8
Outside decoration/structure type	H15	H9
Kitchen	H16	H13
Cooking materials	H17	H11
Water	H18	H12
Bathing	H19	H15
Sanitation	H20	H14
Source of Housing	H21	H16
Purchase Price	H22	
Rent	H23	H17
Name	R1	R1
Relationship to household head	R2	R2
Sex	R3	R3
Birth year and month	R4	R4
Nationality	R5	R5
Current Residence		
<i>Hukou</i> Registration place	R6	R6-R10
<i>Hukou</i> Registration type	R7	R11
Birth place county	R8	R12
Residence 5 years ago		R13
Education		
Illiterate or not	R14	R14
Education level	R15	R15
School enrollment status	R16	R16
Employment and working hours	R17/R18	R17
Industry	R19	R18
Occupation	R20	R19
Reasons for not working	R21	R20/R21/R22
Source of living income	R22	R23
Marital status	R23	R24
Year/month of first marriage	R24	R25
# of births and surviving births, by sex	R25	R26
	(women aged 15-50)	(women aged 15-64)
# of births within a year (women aged 15-50)	R26	R27
Health status (aged 60 or above)	-	R28

Notes: Hx and Rx stand for the labels of items for the households and individuals, respectively, in the questionnaires in 2000 and 2010 censuses.

Innovations and New Features in the 2010 Population Census

The sixth population census was conducted in a special historical moment in China and received much attention for several reasons. During the decade from 2000 to 2010, China had become the second largest economy in the world only after the United States. Accompanying the economic boom had been the accelerating migration, urbanization and urban renewals, rendering the accurate enumeration of the increasingly mobile population more difficult than ever before. On the other hand, the Chinese government, after placing too much emphasis on economic development and promotion of GDP growth for decades, had started paying more attention to issues related to education, medical care, employment, housing, and public service, all of which were closely tied to people's livelihood. Population data were needed for economic/social planning and policy making to address these issues. Last but not least, given that population aging and labor shortage were predicted for the coming decades, the one-child policy, after nearly thirty years of implementation, came under scrutiny. Update and accurate information on fertility and mortality via the population census was seen as essential to the debate on how the country's population policy should be adjusted (Cai 2013; Wang, Cai and Gu 2013).

Hence, the accurate enumeration and full coverage of the population has always been a high priority for the census administrators. While China's relatively immobile population under the surveillance of a powerful and pervasive administrative system once made a full enumeration easier in early censuses, this has no longer been the case since 1990. The revamp of the 2000 census attempted to address some of the challenges in this regard, albeit with limited success. The post-enumeration assessment identified three aspects that hindered accurate enumeration, namely fertility, mortality, and internal migrants (Zhang and Cui 2002, p35).

Based on the lessons learned from the 2000 census and the pilot trial in the 2005 mini-census, further innovative measures were adopted in the 2010 census to address the problem of under-enumeration. These measures were 1) the introduction of a new principle of enumeration; 2) the use of new technology in mapping census tracts; 3) the inclusion of the alien population, including foreign citizens and immigrants from Hong Kong, Macao and Taiwan; and 4) the introduction of new initiatives to strengthen the administrative system of enumeration.

1. The New Principle of Enumeration

While previous censuses relied heavily on the household registration records, it became increasingly problematic to do so, as more and more people had left the place where they were registered (their *de jure* residence). The under-enumeration of the migrant population had become a major problem that the 1990 and 2000 censuses had to address. As mentioned earlier (see the summary of enumeration principles in Table 1), whereas the 1990 census defined migrants as those who had moved across counties/cities and stayed for over one year in their destinations in the five years before the census, many more short-term, within-county/city, or circular migrants were not counted in their *de facto* residence. The 2000 census further improved the enumeration of migrants at their *de facto* rather than *de jure* residence by lowering the threshold of stay duration from 1 year to 6 months and also recording movement across township/street committee boundaries. Following the mini-census in 2005, the 2010 census went further to register both the *de jure* and *de facto* populations at the same time. In other words, everyone was required to put down the residence place where he or she stayed on the evening of October 31, 2010 (reference date) regardless of his or her household registration place, and his or her *hukou* registration place regardless of where he or she was that night.

The new principle emphasized practicality and left little room for either the respondent's own interpretation or the enumerator's own judgment as to who should be counted and who should not. As illustrated in Figure 1, the 2010 census enumeration covered both the current residential population (A+B) and the registration population (B+C), in which A refers to those living in the residence on the census reference date with *hukou* registered elsewhere, B refers to those living with *hukou* registration in the residence, and C refers to those living elsewhere but with *hukou* registration in the residence. Part A in Figure 1 covers both short-term (less than 6 months), short-distance (e.g., across census enumeration areas) movers and the migrant population (6 months or above), the latter of which constitutes an important part of the regular residential population (*changzhu renkou*) nowadays.

Figure 1. The Enumeration Coverage of the 2010 Population Census

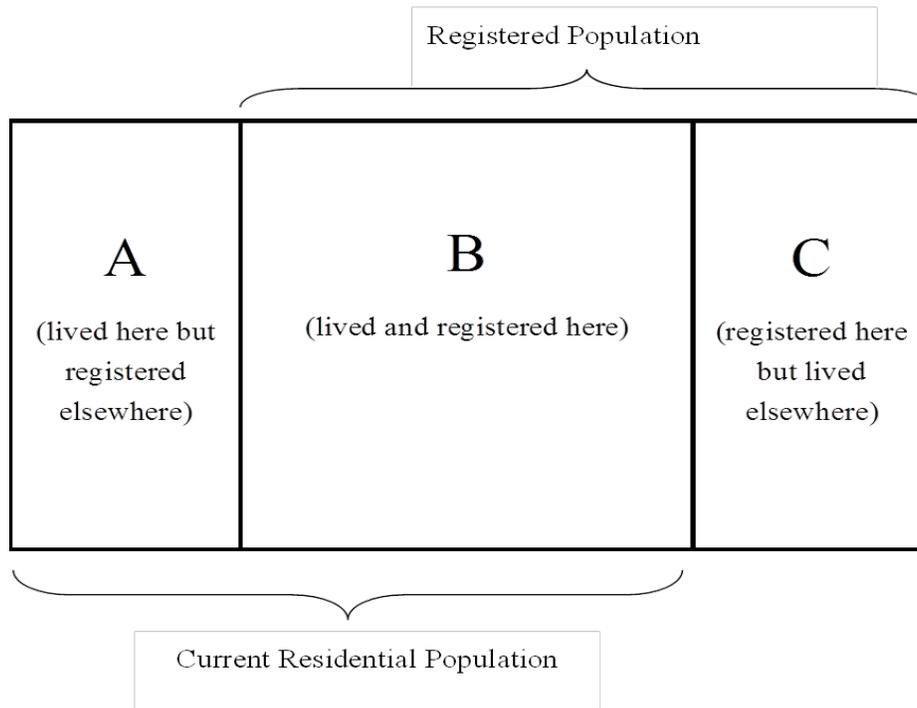


Figure 2 further illustrates three segments of the regular residential population (shaded areas A_2+B+C_1). A_2 refers to migrants who have been living in the current residence for 6 months or more without *hukou* registration in the place. While the threshold was set the same as that adopted in the 2000 census, it also covers those who moved across the boundary of census enumeration areas—a much more precise spatial unit than either township/street committee in the 2000 census or county/district in the 1990 census. Therefore, A_2 covers a subpopulation whose residence and registration are different but still within the same township or a street committee. C_1 refers to those who are registered but have not been in the residence for 6 months or less. A_1 and C_2 refer to the floating population whose regular residence could not be determined. A_1 may partially overlap with C_1 , and C_2 may partially overlap with A_2 .

Figure 2. The Calculation of Regular Residential Population in the 2010 Census

A₁ (lived here for less than 6 months but registered elsewhere)	B (lived and registered here)	C₁ (registered here but left for less than 6 months)
A₂ (lived here for 6 months or more but registered elsewhere)		C₂ (registered here but left for 6 months or more)

This new principle of enumeration in the 2010 census was aimed at covering everyone in their current residence (*xianyou renkou*) as well as those who were registered but absent from the residence (*huji waichu renhou*), thus permitting a full assessment of the floating population because those who have been away for less than six months were still counted at their *de jure* instead of *de facto* residence in 1990 and 2000 censuses. It is clear that this more fine-tuned method greatly reduced the chance of under-enumeration,³ but the risk of double counting could increase at the same time.

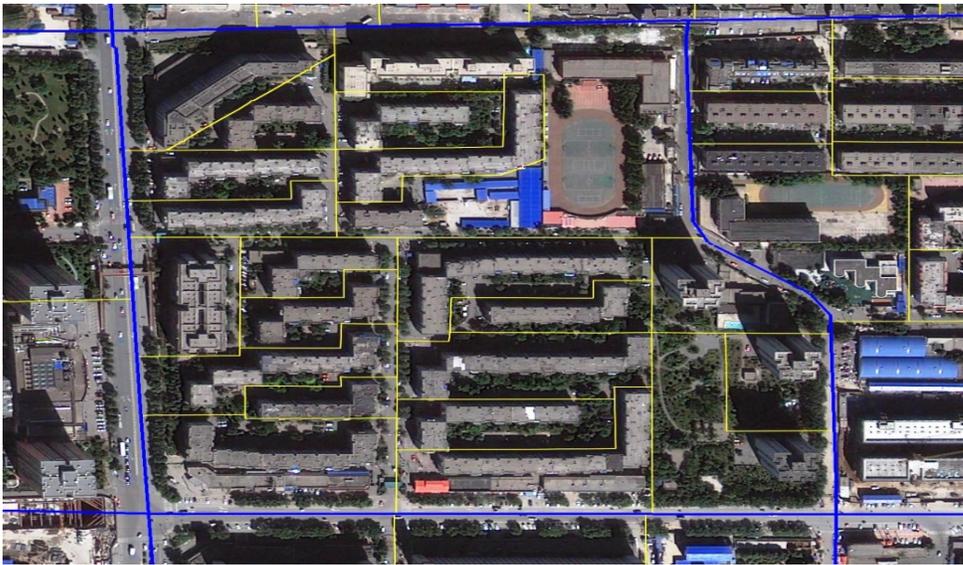
2. The Use of New Technology in Mapping Census Tracts/Enumeration Areas

Under the new enumeration principle, to determine where a person is a regular resident of, it is crucially important to gather accurate information on both residence and *hukou* registration places. Many migrants have unstable/irregular residence which makes it difficult for enumerators to reach them. In a decade of rapid urbanization and urban renewal, villages and neighborhoods have disappeared whereas new ones have come into existence. Moreover, the emergence of the urban housing market has made it possible for a household to have multiple domiciles. The 2010

³ The regular residents in the frequently mobile population are still under-reported, e.g., those people who have left their registration residence for more than 6 months but have lived in their current residence for less than 6 months (an overlap between A₁ and C₂).

census administrators made a special effort to tackle these issues in preparing for the enumeration. After the 2005 mini-census, remote sensing technology (see Figure 3 for a sample image) was employed to assist in drawing maps of all buildings and demarcating census tracts and enumeration areas.

Figure 3. A Remote Sensing Image



According to *the Detailed Regulations for the 6th National Population Census Area Partition, Address Coding and Mapping*,⁴ issued by the Office of Leading Group for the 6th National Population Census under the State Council, the list of census areas at the township level or above that was submitted to the office for approval could not be altered without the Office's permission. Within each township/street committee, a census administrator who was familiar with the local communities was then assigned to work on the division of census tracts and enumeration areas, using the ArcGIS system modified specifically for the census and pre-loaded with remote sensing images (Figure 4).

⁴ The census areas include six levels: provincial, prefectural, county, township, census tract, and census enumeration areas. The boundaries for the first four levels are marked clearly, as they are roughly identical to the administrative jurisdictions.

Figure 4. Base Map of a Census Enumeration Area in the 2010 Census



The census administrator then plotted a detailed map of all commercial and residential buildings with major signs of demarcations (e.g., a river, a road), as shown in Figure 5. Each enumeration area included around 80 residential addresses, and each block or building belonged to one enumeration area only even if it sits on a boundary.

Figure 5. The Remote Sensing Image for a Census Enumeration Area (EA)



The mapping of census enumeration areas enhanced the population coverage, especially the coverage of temporary migrants living in unconventional dwellings. Indeed, 58 percent of all countries in the world conduct population census with the assistance of digital mapping technology and China is one of them. The map boundaries of census tracts were first created in the 2010 census and will continue to be used in future census undertakings in China.

3. The Inclusion of the Alien Population

While the previous five censuses counted only Chinese citizens residing within the territory, the sixth census attempted to cover also the alien population (including foreign citizens and residents from Hong Kong, Macau and Taiwan) for the first time in history, albeit with a separate and brief enumeration form. The enumeration items included address and household ID, name, relationship to household head, sex, birth date, purpose and duration of stay, education, and citizenship. Those from Hong Kong, Macao and Taiwan were asked three additional questions: duration of residing in these regions in the past 6 months, industry and occupation for those aged 15 or above who were working in mainland China.

According to the sixth population census, 1,020,145 alien people were successfully enumerated, including 234,829 from Hong Kong SAR, 21,201 from Macau SAR, 170,283 from Taiwan, and 593,832 foreign citizens. Half of these immigrants resided in Guangdong (316,138) and Shanghai (208,602). While it is unclear how much effort the census takers made to ensure the accurate enumeration of the alien population in China, any attempt at doing so represents a significant progress in the evolution of modern census undertakings in China. Given the increasing globalization of the Chinese economy and the new trend where China is becoming a destination for international migration, enumeration of the immigrant population should be further strengthened and integrated with the national population census in the future.

4. New Initiatives in Strengthening the Enumeration Administrative System

The sixth census has adopted new initiatives to strengthen the administrative system of population enumeration. First, the census has taken advantages of the administrative statistics, such as the household registration records. The *hukou* registration used to be the major basis for the population enumeration in earlier censuses, but the increase in migration and the separation between people and their *hukou* registration place (*de jure* residence) had made the *hukou* data largely outdated. Nevertheless, the 2010 census stipulates the enumeration of both *de facto* and *de jure* populations at the same time, the latter of which requires the careful checking and cleaning of the *hukou* registration data, such as birth without registering *hukou* and death without eliminating *hukou*, and any discrepancy between registration and residential locations. Hence, as

an important part of census preparation, the rectification of *hukou* registration by the police bureaus was strengthened for the count of *de jure* population in the 2010 census. Children born out of the violation of the family planning policies have been a particular concern because families and the local government also had strong incentives to hide the additional births (Goodkind 2011). Prior to the census, these children were provided the opportunity to register in the *hukou* system. While the 2000 census has started adopting such practice, the census authority in 2010 made special effort to promise that such information would not be passed to the birth control authority as a basis for fines, nor would the rectified fertility data be used for the evaluation of local government performance in family planning.⁵ These data, together with the administrative data from other government offices (civil affairs, public health, education, and family planning), were all submitted to the Local Office of Population Census for preparation of the household head rosters before the enumeration.

Second, the Chinese census authority continued to rely on their past experience by setting up a strong administrative system as institutional support. At the central level, the Leading Group for the 6th Population Census involving 25 government agencies was established under the State Council, headed by then Vice Premier Li Keqiang, to coordinate the census activities. Similar agencies were set up at provincial, prefectural, county and township levels to coordinate and organize the census activities, whereas the implementation was mainly carried out at the census tract level (village committees/neighborhood committees), where a tract was divided into multiple census enumeration areas (CEAs), with at least one supervisor for each tract, at least one enumerator for each CEA and one director for every four or five CEAs.

The sixth population census mobilized 6.5 million enumerators to visit more than 400 million households within a period of 40-60 days. According to *the Regulations on the National 6th Population Census* issued by the State Council on May 24, 2010, the enumerators are required to have at least junior high school education, be seconded by staff in a variety of work units such government, social institutions, or public enterprises, or be recruited from village committees/neighborhood committees or local communities at large. The regulations encourage qualified citizens to volunteer for the census enumeration. The seconded enumerators were paid by their own work units, whereas the ones recruited from committees/communities were remunerated with funds earmarked specifically for this purpose in the central and local government fiscal budgets for the census.

⁵ As a result, the household registration status was pending for 13 million people in the 2010 census, compared to 8 million in the 2000 census (Cai 2013, p 373).

A separate team was set up for quality control at each level of the census agency, with detailed guidelines provided by the Office of the Leading Group on the 6th National Population Census. In the pre-census stage, the quality control staff re-checked the CEA map, the vacant residences, and household head rosters. During the enumeration and review stage, the team monitored the whole progress, with a particular focus on the items reflecting the new design, such as those pertaining to individuals living in the residence on the night of Oct 31, 2010, and individuals whose *hukou* were registered in the residence but in absence on that night, as well as the number of births and deaths in the household in the year preceding the census (November 1, 2009 to Oct 31, 2010). The quality control team also manually checked the logic of the items, the completion of the longer questionnaires, and the accuracy of address records. In the quick aggregation stage, the total numbers of *de facto* population and *de jure* population were checked against the *hukou* registration records maintained by the public security bureaus, with the assumption that the enumerated population, either *de facto* or *de jure*, should not be smaller than the registered population. The quality control also covered data coding/recoding and data processing at the county/city/district level. Finally, the quality-check forms were filled out and submitted together with the enumeration forms to the upper-level office in charge of census undertaking. The quality of enumeration was deemed acceptable if seven criteria were met. For instance, the under-enumeration rate must be less than 0.4 percent; the rate of under-reported births and the rate of under-reported deaths must both be less than 0.5 percent (p.109) (Population Census Office under the State Council 2010a, 2010b).

Unlike in previous census exercises, the *Regulations on the National 6th Population Census* also stipulated explicitly legal punishment for those who forged data or modified data without authorization and any citizens who obstructed the enumerations in the 2010 census undertaking. This massive operation combined the traditional top-down administrative system with new means to accommodate the changing social environments for data collection, thus marking another milestone in the development of the modern census undertakings in China.

The Post-Enumeration Assessment of the 2010 Census Data ⁶

With the new measures taken, the Chinese government seemed to be very confident about the quality of the 2010 census data. The quality control procedures described above revealed that the low-age group was undercounted by 11.07 million and 6.04 million in the middle-age group were double counted. The post-enumeration survey of 40,000 households and 120,000 individuals from 402 census enumeration areas also suggested that the under-enumeration rate was 0.12 percent, far below the 1.81 percent in the 2000 census (see Table 1). The 2010 census made an effort to address the three aspects hindering accurate enumeration identified in the post-enumeration assessment of the 2000 census: fertility, morality, and internal migrants (Zhang and Cui 2003, p35).

The good quality can be further affirmed by checking the consistency of the 2010 census data against the 2000's and other administrative information collected by various government agencies, such as household registration data, education statistics, and fertility data provided by the birth control authority, and mortality data provided by the civil affairs authority (Cai 2013). Here we present selected results to illustrate the quality of the 2010 census data, with special attention given to those results on population age structure, under-reported births and deaths, and sex ratios which plagued the 2000 census.

1. Population Age Structure

As mentioned before, an important part of the preparation for the 2010 census was the rectification of the household registration system, namely, to clean and update the *hukou* records contained in the public security system. The population age structure in 2010 is consistent with that in the rectified *hukou* registration data, especially the middle part of the age distribution (see Cai 2013, p 376). Disparities exist mainly for the young and the old aged. Many more youngsters were enumerated in the census than were registered in the *hukou* system, whereas much fewer elderly people were enumerated in the census than were recorded in the *hukou* system. One obvious reason is that the *hukou* administrative system is usually slow to register newborns and to remove the records of the deceased.

⁶ All numbers, tables and figures in this section, unless otherwise indicated, came from Cui, Xu and Li (2013), or were provided by the research team for quality assessment at the National Bureau of Statistics. The author wishes to thank Feng Nailing, Cui Hongyan, and Xu Lan for their generous support.

Inter-censal analyses between 2000 and 2010 can provide further evidence to assess the quality of the census enumeration. Because the census collects information on deaths in the preceding year, the age-specific population in the 2000 census can be checked against that in the 2010 census for consistency. For instance, the enumerated population aged 20 in 2010 should be close to the enumerated population aged 10 in 2000, after taking into account the mortality rate based on the relevant life table.

Figure 6 presents the age-specific population in 2010 (without smoothing) for those aged 10 or above (aged 0 or above in 2000) for males and females separately. For both males and females aged 20 or above (in 2010), the enumerated populations between the two censuses show remarkable consistency, confirming the reliability of the two censuses for the adult population. On the other hand, the under-enumeration of children aged 0-9 in 2000 is apparent; it is more substantial for females than for males, based on the evidence that the size of the same cohort (aged 10-19) in 2010 is much larger than that enumerated a decade ago. Therefore, the 2010 data may be used to re-assess the under-enumeration of those aged 0-9 in 2000 census.

As shown in Table 3, based on the enumerated population in 2010, we can back-cast the corresponding figures and check them against the actual enumerated population in 2000. Results suggest that 16.89 million children and adolescents aged 0 to 9 were not enumerated in the 2000 census, so the under-enumeration rate was 10.61 percent. This evidence provides further evidence in the improved operation and data quality of the 2010 census.

Given the high rate of under-enumeration among young children, what is the quality of the data on those aged between 0-9 in the 2010 census? An inter-censal analysis cannot be conducted at this time because data from the next census would be needed for that. Based on the annual administrative records of newborns since 2001, we can somewhat assess the extent of under-enumeration among those aged 10 or below. Table 4 presents the reported newborns from the family planning records against the enumerated figures in 2010.⁷ The results suggest the under-reporting of 11.07 million children aged 0-9, or a rate of 7.56 percent, which, despite being non-negligible, is still a big improvement over the rate in the 2000 census. Again, this improvement is attributable to the pre-census rectification effort to allow out-of-quota births to register for a *hukou* without the parents' being punished for violating the one-child policy, but the year of 2010 is an exception, probably because there was not sufficient time to immediately report or rectify the new births in that year.

⁷ To be certain, the family planning records could also be underreported.

Figure 6. Inter-censal Survival Rate, 2000-2010, Male and Female

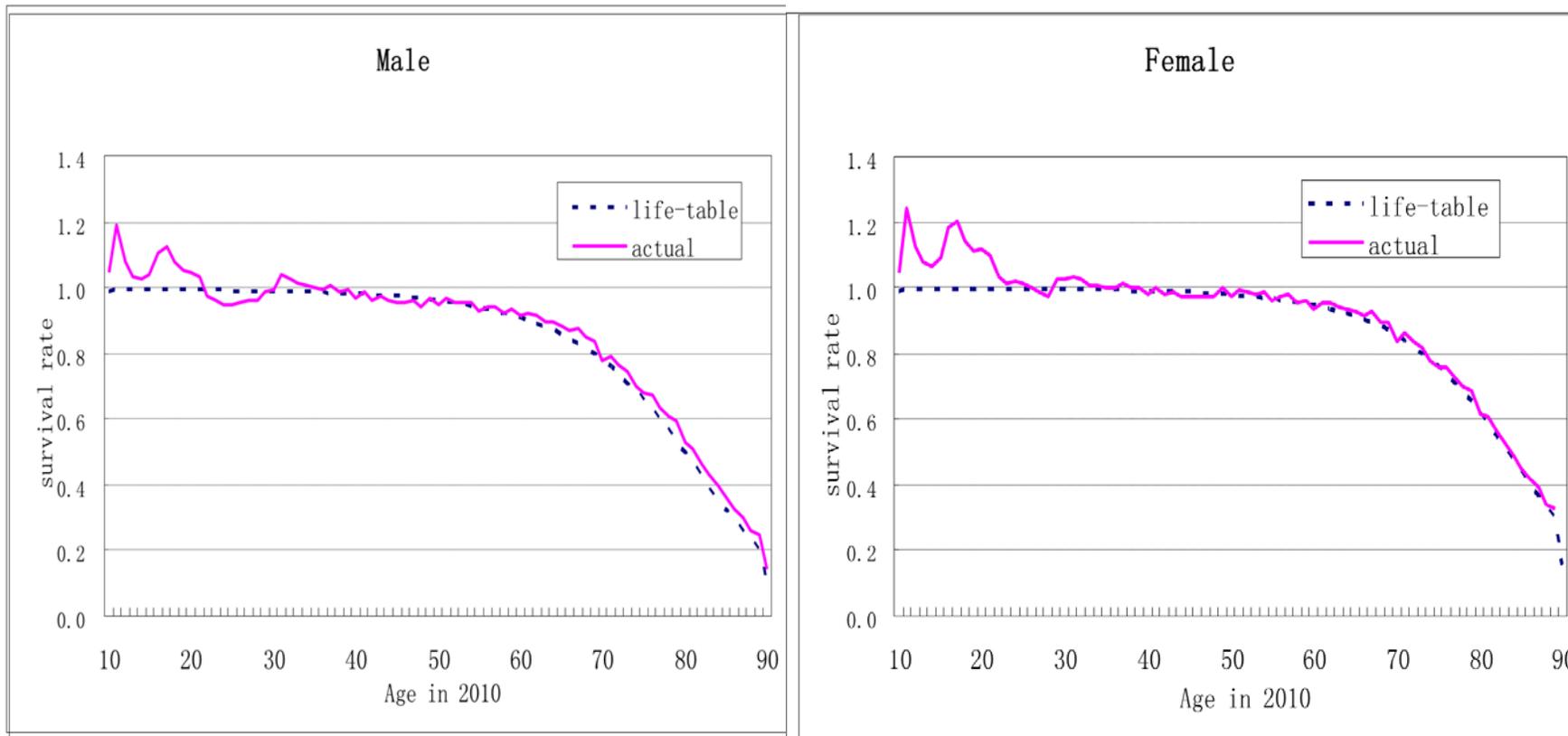


Table 3. Reassessment of the Under-enumeration of Those Aged 0-9 in the 2000 Census via the 2010 Census (unit: 10,000)

2010		2000			Diff.	Under-enumeration rate %
Age	Enumerated	Age	Enumerated	back-casted from 2010		
10	1445	0	1379	1466	86	6.25
11	1394	1	1150	1403	254	22.06
12	1540	2	1401	1549	147	10.53
13	1523	3	1445	1530	84	5.85
14	1589	4	1522	1596	74	4.86
15	1802	5	1693	1810	117	6.90
16	1879	6	1647	1887	240	14.57
17	2078	7	1791	2087	295	16.49
18	2082	8	1875	2092	216	11.54
19	2172	9	2008	2183	175	8.69
Total	17505	Total	15913	17602	1689	10.61

Table 4. Assessment of Under-enumeration of Children Aged 0-9 in the 2010 Census (unit: 10,000)

Birth Year	Reported* newborns	Age in 2010	Forecasted Population	Enumerated in 2010	Difference
2001	1702	9	1654	1425	229
2002	1647	8	1602	1367	235
2003	1599	7	1555	1343	213
2004	1593	6	1550	1480	70
2005	1617	5	1575	1473	101
2006	1584	4	1543	1522	21
2007	1594	3	1554	1525	29
2008	1608	2	1570	1562	8
2009	1591	1	1568	1566	2
2010	1592	0	1576	1379	198
Total	-	-	15748	14641	1107

*Figures from the National Population and Family Planning Commission.

2. Fertility and the Sex Ratio

The under-enumeration of children would also have an impact on the accuracy of several other demographic characteristics measured in the census.

The level of fertility has become one of the most contentious issues in the study of China's population in recent years as it bears important implications for the adjustment of the one-child policy after its three decades of implementation. The 2010 census provides new

evidence with which to estimate the total fertility rate (TFR). Based on the registered births for all women of reproductive age in the shorter questionnaire, the TFR was estimated to be 1.18, which seems to be low. Data collected with the longer questionnaire show that there were 1.32 million newborns in the preceding year and thus the TFR was 1.30, which is 10.17 percent higher than the 1.18. Data from the family planning system show that there were 15.92 million newborns in 2010, higher than the figures enumerated in the census. Under-reporting is clearly a common issue here and the adjusted TFR is believed to be around 1.50. The different ways of estimation tend to arrive at the same conclusion: fertility in China as of 2010 was already very low. This highlights the demographic challenges that China is going in encounter in the coming decades.

Related to the controversy over the level of fertility and the under-enumeration of children is the changing sex ratio. The 2010 census provided the evidence needed to re-assess the issue of sex imbalance, and one surprising finding was that the sex ratio fell back to 105.2, after increasing for almost two decades from 106.3 in 1982, 106.6 in 1990, to 106.7 in 2000. The reverse in trend deserves a closer examination.

Figure 7 plots two series of sex ratios by age (aged 10 or above in 2010) without smoothing. Discrepancies exist mainly for the young and the old aged. For the old age group (aged 60 or above), because women tend to live longer, the sharp drop in 2010 does not come at a surprise, probably because more un-reported death records (more likely to be old males) may have been removed in the pre-census rectifications. For the young age group, especially those aged 10-19 in 2010 or 0-9 in 2000, the under-enumeration was biased towards females as both Figures 6 and 7 suggest. The decrease in the sex ratio of those aged 10-19 could be a result of the fact that the 2010 census recovered a large proportion of “missing” newborn girls. Table 5 presents the results from the inter-censal analyses of sex ratios for those aged 0-9 in 2000 (i.e., those aged 10-19 in 2010) and confirms the speculation. For instance, the 2010 census shows that the sex ratio for those born in 1991-2000 is 111.85, which is still above the normal level. Based on the sex ratios reported in 2010, we can extrapolate the sex ratio in 2000. The results show that the sex ratio in 2000 should be 112.05, with a large gap from 117.45, which was previously reported in 2000 census. Certainly the sex ratio in 2010 might also have been overestimated since the under-enumeration of girls is a common problem, but it would not be as serious as that in 2000.

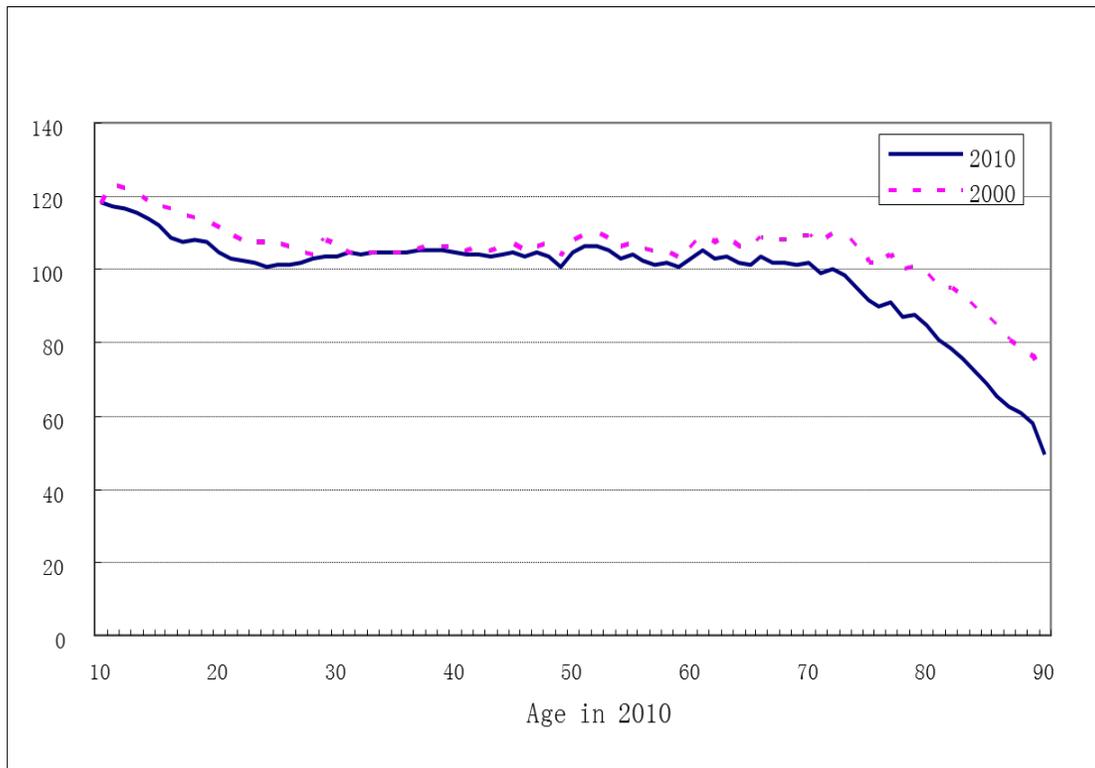
Figure 7. Inter-censal Analysis of the Sex Ratio

Figure 7 also shows a decline in the sex ratio for those aged 20-29. Table 6 presents the sex ratios for selected age groups (5 year intervals). Again, the sex ratio at birth seems to be higher in 2010, and is almost comparable to that in 2000, due to the reasons mentioned above. However, for those in their mid-20s, the sex ratio seems to be close to 100, which is slightly unusual when a figure around 105 is considered the standard. As shown in Table 6, the sex ratios drop sharply for the 20-24 and 25-29 age groups to 102.5 and 102.2, respectively, and then bounce back to the normal level for those aged 30 or above. One plausible explanation is that males aged 20-29 were under-enumerated in the 2010 census, because they were more mobile than females of the same age. Note that the sex ratios from *hukou* registration records are 106.7 and 105.5 for the 20-24 and 25-29 age groups, respectively (Cai 2013, p385).

Table 5. Inter-censal Analysis of the Sex Ratio (unit, 10,000 persons)

2010				2000				2000
Age	Male	Female	Sex Ratio	Age	Male	Female	Sex ratio	Enumerated Sex ratio
10	783	662	118.23	0	794	672	118.17	117.79
11	752	641	117.30	1	758	645	117.46	122.65
12	829	711	116.57	2	834	714	116.75	122.07
13	816	706	115.53	3	821	709	115.72	120.44
14	846	743	113.92	4	851	746	114.41	118.52
15	952	850	112.06	5	957	853	112.27	117.77
16	980	900	108.89	6	985	902	109.10	116.59
17	1076	1001	107.48	7	1082	1005	107.70	115.21
18	1081	1001	107.99	8	1087	1004	107.23	114.61
19	1126	1047	107.55	9	1132	1050	107.81	113.48
10-19	9242	8263	111.85	0-9	9301	8301	112.05	117.45

Table 6. Sex Ratio for Selected Age Groups in the 2010 Census (unit: million)

Age	Males (unit: million)	Females (unit: million)	Sex Ratio
0-4	41.1	34.5	119.1
5-9	38.5	32.4	118.7
10-14	40.3	34.6	116.2
15-19	52.2	48.0	108.7
20-24	65.0	63.4	102.5
25-29	51.3	50.2	102.2
30-34	49.8	47.6	104.5
35-39	60.5	57.7	105.0

To summarize, the analyses of fertility and sex ratios reveal, while the quality of the 2000 census was acceptable by international standards,⁸ the 2010 census possessed even higher quality, attributable to the effective pre-census preparation such as the *hukou* rectification. While the under-reporting of newborns, especially of girls, continue to be prevalent in the census, it is indisputable that China's fertility is far below the replacement level of 2. This has led to the recent readjustment of the one-child policy in China.

⁸ For instance, the undercount was, respectively, 1.7 percent in the 2011 Australian census and 1.9 percent in the 2011 Canadian census. The US census had a net undercount of 1.61 percent in 1990, an over-count of 0.49 percent in 2000 and an over-count rate of 0.01 percent in 2010.

3. Mortality and Population Aging

The 2010 census reported 7.42 million deaths from November 1, 2009 to Oct 31, 2010, with a crude death rate of 5.58 per thousand. This is much lower than that reported in either the 1990 census or the 2000 census. A rough calculation based on age-specific death yields the life expectancy of 77.95 years (75.65 years for men and 80.49 years for women), representing an increase of 6.55 years (6.02 years for men and 7.16 years for women) from the life expectancy in 2000. Table 7 provides inter-censal comparisons of death rates, standardized by the population age structure in 2000. While the decline in mortality (including infant mortality) reflects the social progress accompanying the economic growth and urbanization in China from 2000 to 2010, the drop (of 30.7 percent) within a decade is too sharp and raises a legitimate concern over the data quality. According to the annual 1 per thousand population change surveys conducted by the National Population and Family Planning Commission, from 2001 to 2011, the death rate ranges from 6.43 per thousand in 2001 to 7.14 per thousand in 2011. The reported death rate of 5.58 per thousand seems too low. Apparently the under-enumeration rate of deaths is not negligible in the 2010 census.

Table 7. Registered and Standardized Death Rates, 1990-2010

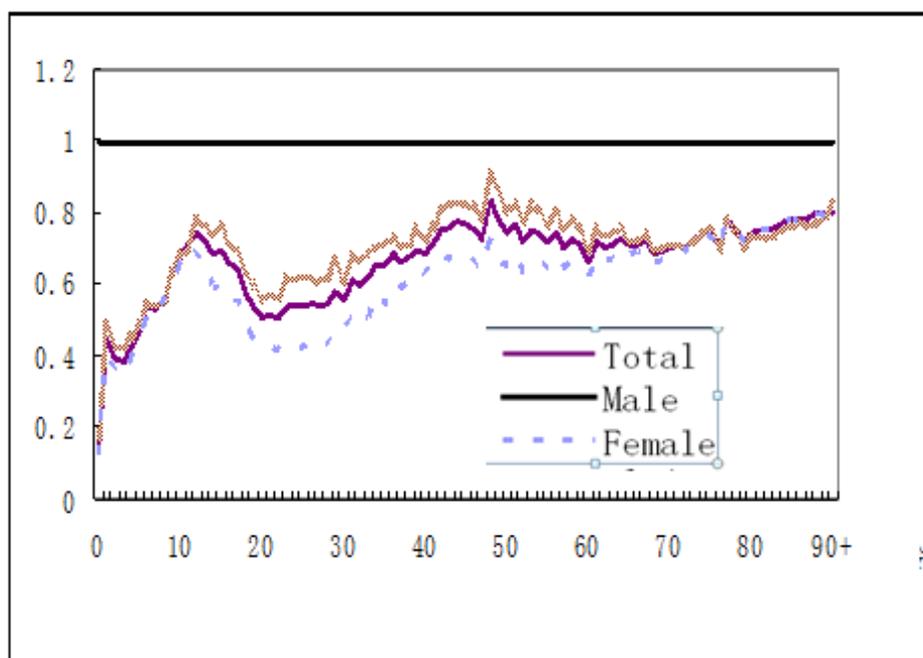
Year	Registered ‰	Standardized	Drop % (vs. previous census)
1990	6.65	7.39	-
2000	5.92	5.92	19.9
2010	5.58	4.10	30.7

Figure 8 plots the age-specific mortality rates against those in the 2000 census (set at 1). It can be observed that the drop is usually large among those aged below 10 and also those aged 20-30. Given the high rate of under-enumeration of the population of infants and young children, it would not be surprising if the death numbers were also under-reported among this group. A greater extent of double counting of the 20-30 age group could lead to a large denominator and thus contribute to the sharp drop in death rates. The drop is more pronounced for women than for men in this age group. A plausible explanation is that the birth-related mortality has declined because women have been postponing pregnancy and giving fewer births in the past decade. These speculations should be further explored.

How should the under-enumeration rate of deaths in the 2010 census be assessed? One way is to compare the enumerated population aged 0 or above in 2000 and the enumerated population aged 10 or above in 2010. The difference of 77.13 million is assumed to be the number of deaths. If we assume the population aged 20-45 in 2010 was over-enumerated by 6.04 million and take into account the deaths of those aged 0-9, the total number of deaths from 2000 to 2010 can be

roughly adjusted to 86.37 million, representing 8.637 million deaths annually. Linear extrapolation gives 9.09 million deaths in 2010, against 7.42 million reported deaths. The under-enumeration rate of deaths is thus estimated to be 22.5 percent. Considering the under-enumeration rate of deaths, the National Bureau of Statistics has adjusted the life expectancy to 74.83 years old in 2010, which is announced in the *Communique* of the sixth population census.

Figure 8. Age-specific Death Ratio in 2010 Relative to That in 2000 for Males and Females



Despite the adjustments, the improvement of life expectancy in China is dramatic by any international standards, just like its socioeconomic development since the late 1990s. As a result of both the decline in fertility and the improvement of life expectancy, the Chinese population aged rapidly between 2000 and 2010. As shown in Table 8, people aged 60 or above accounted for 13.31 percent of the total population in 2010, increasing from 10.83 percent in 2000. A further break-down by region shows that the population aged more rapidly in townships, especially villages, than in cities: the rural aging population increased from 11.27 percent in 2000 to 14.98 percent in 2010, probably as a result of the out-migration of young people to cities and the under-enumeration of children in rural areas. Chinese policy makers should pay close attention to this pattern in preparing for the country's population aging-related challenges in the coming decades.

Table 8. The Trends in Population Aging in China, 2000-2010 (unit %)

Age group	National		City		Town		Village	
	2000	2010	2000	2010	2000	2010	2000	2010
60-64	3.47	4.40	3.53	3.79	3.12	4.03	3.52	4.92
65-69	2.92	3.08	2.95	2.58	2.52	2.81	2.99	3.50
70-74	2.13	2.47	2.02	2.20	1.80	2.22	2.25	2.75
75-79	1.33	1.79	1.17	1.58	1.09	1.56	1.44	2.01
80+	0.98	1.57	0.87	1.33	0.84	1.38	1.07	1.80
Total	10.83	13.31	10.54	11.48	9.37	12.0	11.27	14.98

To sum up, the above analyses suggest the huge improvements in the quality of the 2010 census over that of the 2000 census. The under-enumeration rate is lower, and it was mostly the children aged 0-9 who were under-enumerated (11.07 million or 7.56 percent). The census seems to have captured a sizable group of youngsters aged 10-19 who were missing from the 2000 census population (children aged 0-9). The under-enumerated fertility is about 15.06 percent, whereas the under-enumerated mortality, mostly infant mortality, is about 22.5 percent (Cui, Xu and Li 2013). While the abnormal sex ratios suggest that there could be a certain degree of under-enumeration of those aged 20-29, especially for men due likely to migration, the low-to-middle age group (aged 15-54) were double-counted by 6.04 million, due to the new designs implemented in the 2010 census. As a result, the revised enumerated population is very close to the total population released in the *Communique* (1339.72 million).

Tracking Social Changes from China's Population Censuses: Selected Findings

As mentioned at the beginning, the evolution of the census undertakings *per se* over the six decades largely reflects the trajectory of social and political changes in China. The data obtained from the censuses provide an indispensable source of information for social scientists to track the large-scale social changes, especially those related to education, employment, family and marriage, migration and urbanization, among others. The micro-data from a census with a large sample size and increasingly complicated designs can be analyzed to address the interrelationships between population and other social system variables that are seldom addressed in conventional demographic analysis.

Many key indicators that characterize population, nevertheless, have had their definitions and classifications altered over time. To track the social trends, we must adopt measures that are comparable across different census rounds, especially between the transition stage (1982 and

1990) and the modern stage (2000 and 2010). Three issues—internal migration, urbanization, and occupational changes—which reflect important aspects of China’s socioeconomic transformation are chosen here to illustrate the necessity of paying attention to the way measures are defined.

1. Internal Migration

As discussed in the overview of the Chinese census undertakings, the definition of migration has been revised several times for the enumeration of the increasingly mobile population since the 1990s. In the 2000 and 2010 censuses, the migrant population is similarly defined as those who have stayed in the residence for over 6 months but have their *hukou* registered in other townships. As shown in Table 9, the cross-township migrants increased by 81.03 percent from 144,390,748 in 2000 to 260,937,942 in 2010. Of courses, these figures also cover the residence-*hukou* separation (*renhu fenli*) within the county/city boundaries.

In the 1990 census, only cross-county movements for over a year were considered as migration, whereas in both the 2000 and 2010 censuses, movements across the township and street committees over six months were considered as migration. Furthermore, migration in 2000 and 2010 can be further differentiated into within-county, cross-county (within province) and cross-provincial migration.

Therefore, the increase in the migration counts is partly due to the change in criterion. As shown in Table 9, cross-county migration clearly dominated all migrations, accounting for 83.9 percent (=121,175,062/144,390,748) of all migrations in 2000 (29.4 percent cross-provincial) and 98.3 percent in 2010 (32.9 percent cross-provincial). Internal migration and geographic redistribution have fundamentally transformed the Chinese society and economy over the past decades, and their profound impacts deserve further analyses with the census data.

Table 9. Trends in Population Migration, 1990-2010

	1990	2000	2010
Defined migrants	20,059,571	144,390,748	260,937,942
Cross-county	20,059,571	121,175,062	256,441,680
Within province		78,756,500	170,565,343
Cross-province	-	42,418,562	85,876,337

Sources: Population Census Office under the State Council and Department of Population Statistics, State Statistical Bureau (1993); Population Census Office under the State Council and Department of Population, Social, Science and Technology Statistics, National Bureau of Statistics (2002); Population Census Office under the State Council and Department of Population and Employment Statistics, National Statistics Bureau (2012).

2. Urbanization and the Persisting Hukou System

China has experienced a rapid urbanization over the past two decades. As shown in Table 1, the earlier population censuses recorded only addresses in accordance with the Chinese administrative hierarchy at the time. In the 1953 census, urban population referred to those enumerated in the administrative jurisdictions of cities and towns and included both agricultural and non-agricultural populations, whereas in the 1964 census, only those with non-agricultural *hukou* were counted, though the actual discrepancy might be negligible because of the rigid control of migration via the *hukou* system. The 1982 census, like the 1953 census, simply considered all those enumerated in the jurisdictions of cities and townships as the urban population, and recoded the *hukou* registration type (agricultural vs. non-agricultural) based on whether the enumeration community is a production team or neighborhood committee. In other words, individuals were not asked directly about their *hukou* registration type in the census questionnaires; this item was simply recoded, as was the residence type, from the address. As the defined urban population included those living in villages within suburban areas, the level of urbanization may be overestimated. Given the substantial restructuring of China's administrative jurisdictions in the 1980s, in which many counties (*xian*) were promoted to cities (*shi*) and many townships (*xiang*) were upgraded to towns (*zhen*), the inclusion of rural residents in the designated urban administrative jurisdictions in population enumeration would inflate the level of urbanization in China (Chan 1994).

Indeed, the differentiation between urban and rural areas has become an even more difficult task since the 1980s because of the surging internal migration and the industrialization in the countryside. The urban/rural distinction is no longer as clear cut as it used to be. In response to the increasing criticism of the urban-rural classification schemes, the Chinese statistical agencies adopted another dimension in defining urban and rural populations in the 1990 census, by resorting to smaller and subdivided residence units as a basis for aggregation. Starting from the 1990 census, the census tracts and enumeration areas were standardized and assigned 17-digit address codes, which were subsequently revised in 2000 and 2010. The first 6 digits for province (1-2), prefecture (3-4), and county (5-6) or their equivalent are drawn from the national standard code for the jurisdiction of the People's Republic of China, whereas the next six digits for township (7-9) and village (10-12) or their equivalent are coded by local statistical agencies. Following the standard address codes are the urban-rural residence type (13-

14) and classification (15-17). The last 3 digits are most relevant to the measure of urbanization. The details of the urban-rural classification scheme are presented in Table 10, in which 1 stands for urban areas and 2 stands for rural areas at the first digit (the 15th digit in the census address code). The division of urban and rural areas as well as cities, towns, and villages is based on these standardized codes, which are publicly available on the website of the National Bureau of Statistics.

Table 10. Urban-Rural Classification Scheme of Addresses in Chinese Censuses

111	City main district area (<i>zhu chengqu</i>)
112	City and township mixed area (<i>chengxiang jiehe qu</i>)
121	Town central area (<i>zhen zhongxin qu</i>)
122	Town and township mixed area (<i>zhenxiang jiehe qu</i>)
123	Special area (<i>teshu quyue</i>)
210	Township central area (<i>xiang zhongxin qu</i>)
220	Village (<i>chunzhuang</i>)

Source: <http://www.stats.gov.cn/tjsj/tjzb/tjyqhdmhcxhfdm/>

The new standardized classification scheme has enhanced, to a significant degree, the temporal and international comparability of the official account of the Chinese urban population. As shown in Table 11, China has made much progress in urbanization over the past two decades, and the pace has only accelerated since 2000.

According to the roughly comparable criterion, the populations residing in cities and townships (*de facto* population) accounted for 26.2 percent of the national population in 1990, 36.1 percent of the national population in 2000, and 49.7 percent of the national population in 2010. The urbanization trend could be driven by two major forces. The first is the rural-to-urban migration, particularly to the coastal metropolitan areas (also see Table 9); the second is the urban spatial expansion which has incorporated more of the rural population into the jurisdiction of cities and townships. On the other hand, the reform of the *hukou* system continues to lag far behind, as evidenced by the slow growth of the population with non-agricultural (urban) *hukou* status (urban *de jure* population).⁹ As the new leadership of the Chinese government places much emphasis on promoting urbanization in the policy agenda, the 2010 census data are expected to provide a solid basis for the analyses of trends and for policy advice in this regard in the future.

⁹ *Directives on Further Reform of the Household Registration System*, issued by the State Council on July 30, 2014, stipulated to establish a nationally unified registration system with no distinction between rural and urban registration status, but the effect remains to be seen for years to come.

Table 11. Trends in Urban De Facto Population, Urban De Jure Population and Non-agricultural Employment in China, 1990-2010 (%)

	1990	2000	2010
Urban <i>de facto</i> population	26.2	36.1	49.7
Urban <i>hukou (de jure)</i> population	19.5	24.7	29.1
Non-agricultural employment	29.4	35.5	51.7

Sources: Population Census Office under the State Council and Department of Population Statistics, State Statistical Bureau (1993); Population Census Office under the State Council and Department of Population, Social, Science and Technology Statistics, National Bureau of Statistics (2002); Population Census Office under the State Council and Department of Population and Employment Statistics, National Statistics Bureau (2012).

3. Occupational Classification and Occupational Changes

The fundamental driver of urbanization is the creation of various non-farm employment opportunities. Over the past decades China has reached a historical turning point in its urbanization process, accompanied by the transfer of laborers from farm to non-farm sectors. The population census has provided a unique source of information documenting the temporal trends in occupational changes in much greater detail in this regard.

In the transitional stage of the census undertaking, the classification of occupation (as well as industry) has been standardized.¹⁰ Enumerators typically recorded on the questionnaires descriptions of the jobs held by working adults. These descriptions are subsequently coded by a group of well-trained staff into the 3-digit Chinese Standardized Classification of Occupation (CSCO) issued by the National Bureau of Statistics. The 1982 and 1990 censuses adopted a similar CSCO scheme, consisting of 7 large categories, 69 medium categories, and more than 300 detailed occupations. Both the 2000 and 2010 censuses relegated occupation to the long questionnaire. They also completely changed the CSCO scheme, which now consisted of 6 large categories, 62 medium categories and 407 detailed occupations.¹¹ Census data analysts on relevant issues shall pay attention to these changes.

¹⁰ Here we focus on occupational classification as it is more relevant than industry classification to social scientists interested in analyzing population census data.

¹¹ For instance, in 1982-1990, the 7 broad categories (with code) in the CSCO scheme were (0/1) staff in various kinds of scientific and technical work; (2) government agency, party committee, organization and institution managers; (3) office workers and related staff; (4) working staff in commerce; (5) working staff in service trade; (6) farming, forestry, animal husbandry and fishery workers; and (7/8/9) production, transportation and related workers. In 2000-2010, the 6 broad categories in the CSCO were: (0) leading cadres of party and government organizations and institutions; (1/2) professional and technical staff; (3) office workers and related staff; (4) commercial and service workers; (5) farming, forestry, animal husbandry, fishery and water resources workers; and (6/7/8/9) operators of production and transportation equipment and related workers.

As Table 11 in the preceding section clearly shows, the growth of non-farm employment had been much faster between 2000 and 2010 (from 35.5 percent to 51.7 percent) than between 1990 to 2000 (from 29.4 to 35.5). More specifically, Table 12 presents the changing occupational structures from 2000 to 2010. Whereas the employment population increased by only 7 percent, the population specifically in farm employment declined by 19.8 percent, in contrast to the growth in the number of commercial and service workers (by 88.6 percent), the number of operators of production and transportation equipment and related workers (by 52.0 percent), the number of office workers and related staff (by 49.4 percent), and the number of professional and technical staff (by 28.2 percent). The transition from rural to urban, and from farming to manufacturing to services, marks fundamental changes in social organization and the lives of individuals, with profound implications for the country's socioeconomic future.

Table 12. Changes in the Occupational Structure in China, 2000-2010

First code	Large category	2000	2010	Growth	Growth %
0	Leading cadres of party and government organizations and institutions	1,115,723	1,268,641	152,918	13.7
1/2	Professional and technical staff	3,814,175	4,890,941	1,076,766	28.2
3	Office workers and related staff	2,071,048	3,093,184	1,022,136	49.4
4	Commercial and service workers	6,136,967	11,572,490	5,435,523	88.6
5	Farming, forestry, animal husbandry, fishery and water resources workers	43,107,741	34,565,439	-8,542,302	-19.8
6/7/8/9	Operators of production and transportation equipment and related workers	10,584,962	16,087,734	5,502,772	52.0
	Unclassified	44,273	69,560	25,287	57.1
Total		66,874,889	71,547,989	4,673,100	7.0

Sources: Population Census Office under the State Council and Department of Population, Social, Science and Technology Statistics, National Bureau of Statistics (2002); Population Census Office under the State Council and Department of Population and Employment Statistics, National Statistics Bureau (2012). Tabulations are based on 10% long-form data in both 2000 and 2010.

The longer questionnaire in 2000, and especially the one in 2010, solicited rich information on those who were not working. In 2010, those who were not working were further divided into the economically inactive group and the unemployed group. Overall, China's non-working population had increased by nearly 90 million ($[30,150,823+2,118,312-23,403,664]*10$) in that decade alone. There were several reasons behind the growth of the non-working population: an increase in the number of students enrolled in school by about 21 million (due to the protracted education), an increase in the number of retirees by about 22 million (as a result of population aging), an increase in the number of household workers by 14 million (mostly women), and an increase in the number of people who have lost the ability to work by 14 million (presumably due to health reasons). The 2010 census also recorded some of the other reasons for why people were economically inactive or unemployed. For example, about 9 million people had never worked after graduation, and more than 5 million of them were still looking for a job. There were 16 million (87,519+84,183) landless peasants in the countryside, half of which were looking for employment. Such insights could not have been gleaned from tabulations released by the National Bureau of Statistics, but required more carefully designed in-depth analysis of the micro-level data.

Table 13. The Growth of the Nonworking Population Aged 15 or Above, 2000-2010

	2000	2010	
	Not working	Economically non-active	Unemployed
Enrolled in school	4,880,557	6,988,586	
Household work	7,015,953	8,411,391	333,973
Retiree	4,129,668	6,411,884	27,877
Lost ability to work	3,657,920	5,138,434	
Never worked but looking for a job	1,317,487		
Never worked after graduation		409,319	509,093
Jobless but looking for a job	1,162,401		
Jobless (<i>danwei</i> reasons)		198,316	404,441
Jobless (personal reasons)		445,611	321,458
Land requisitioned		87,519	84,183
Others	1,239,678	2,059,763	437,287
Total	23,403,664	30,150,823	2,118,312

Sources: Population Census Office under the State Council and Department of Population, Social, Science and Technology Statistics, National Bureau of Statistics (2002); Population Census Office under the State Council and Department of Population and Employment Statistics, National Statistics Bureau (2012). Tabulations are based on 10% long-form data in both 2000 and 2010.

Summary and Unanswered Questions

To sum up, this report documents the evolution of census undertakings in China since 1953, which have come a long way. The six population censuses are divided into three stages according to their design, operation and sophistication: the primitive stage (the 1953 and 1964 censuses), the transition stage (the 1982 and 1990 censuses), and the modern stage (the 2000 and 2010 censuses). The report shows that how the censuses were conducted and what social and demographic information was collected to a large extent reflect the changing social and political situations in China over the six decades. Given the limited data collected and the relatively simple designs of the first two censuses, the report highlights the changes made to the 1982 census, the innovations in the 2000 census, and the improvements in the 2010 census as well as the rationales behind those changes. The review affords several insights into the trajectory of the census undertakings in China.

Firstly, the population census has become increasingly sophisticated. To meet the public and government demand for social information, the Chinese census has been successfully transformed from a simple head counting exercise to a data collection enterprise in terms of its grand scale, refined design, expanded content, and application of technology. Both the 2000 and 2010 censuses, especially their long- form data provided a rich and indispensable source of facts on the changing society.

Secondly, the population census continues to be highly focused on the quality of enumeration. Thanks to the Chinese government's high capacity for mobilization, the enumeration quality of all censuses has proved to be reasonably high by international standards. Results from the inter-censal analyses, the consistency check against other administrative data, and the post-enumeration surveys lend strong support to the claim that the 2010 census is among the two best population censuses in China's history, with the other being the 1982 census.

Finally, the census undertaking in China has become increasingly professionalized and standardized. Since the 1982 census, which has borrowed international expertise as the first attempt to modernize China's census system, the Chinese census authority has made a constant effort to ensure enumeration accuracy by regularly revising the enumeration principles (definitions of residents to be enumerated), adopting innovative designs (having a short and a long forms), and devising standard coding schemes (e.g., address codes for urban-rural

classification, occupational codes) to minimize the room for enumerators' own judgment. As this report has shown, the census undertaking had all but matured by 2010.

Needless to say, the census undertaking in China is expected to continue to evolve in response to the changing social environment, the increasing demand for relevant information and advances in technology. In light of the observations on the evolution of census undertakings, there are a few issues that deserve visionary thinking and stance on the part of the Chinese census planners.

Firstly, how should the increasing data demands from a variety of stakeholders be accommodated? While a long-form questionnaire allows more questions of interest to different parties to be included, it is unclear to most data users/analysts as to what questions should be included and what should be left out. To enhance transparency in the process of consultation and decision making, a scientific committee comprising experts and census officials might be formed to review and endorse the questionnaires and designs.

Secondly, how can the government bureaucratic system and administrative records be more effectively utilized in census operation? Whereas the success of past census operation is largely attributable to the bureaucratic system with its high mobilization capacity, whether such a hierarchical system will continue to serve the function and at what cost are open questions that the Chinese census authorities should attempt to answer in preparing for the next census in 2020. While the 1982, 1990 and 2000 census enumerations all witnessed a dramatic deviation from the registration records, the success of the 2010 one can be attributed partly to the new enumeration principle and partly to the substantial rectifications of *hukou* registration records at the police bureaus. The administrative records, including *hukou* registration, birth records, and school enrollment statistics, which are increasingly digitized and more frequently updated, could serve as an additional source of information for fine-tuning the census enumeration.

Thirdly, how can the fieldwork be operated more effectively to enhance the access to certain groups that are typically under-enumerated? Results from the inter-censal analyses between 2000 and 2010 suggest that an under-reporting of births and deaths among infants and children under age 10 continues to constitute a serious challenge for census enumerations in China in the years to come. Births might be underreported by families to avoid punishment for violating the one-child policy and by the local government to meet certain performance targets. Deaths of aged people might be also underreported by families so they could keep receiving benefits linked to

pension and social security. New measures in both designs and data collection will have to be put in place to deal with these issues. Publicity programs should target specific groups.

Finally, how can the accessibility and utility of the census data be enhanced? While the tabulated data in each census have been published in printed volumes, the rich information contained in the census has yet to be thoroughly exploited. Under international guidance, the 1982 census had set a good precedent in making the micro data available (Minnesota Population Center 2014). The quality census data would provide a great opportunity for further in-depth analyses to track social and economic changes that can inform social and economic policies. The data may also be integrated with other social, economic and geographic data to realize even greater potential for applications. The infrastructures built in the 2010 census, such as address database and community mapping, as well as the aggregated population statistics at even smaller spatial units, could provide a complete framework for other sampling surveys.

In sum, given that the social and economic factors that have rendered the population census undertaking even more difficult than before, the challenges discussed above are unlikely to fade away in the coming decades. The census authorities of China, therefore, should prepare for these challenges and continue to seek more innovative designs and methods to ensure a wide coverage, accurate enumeration, and comprehensive contents in the 2020 census.¹²

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¹² Details are to be elaborated in a separate report, *Census Recommendations for the Future in China: Looking Ahead to 2020*.

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