Program on Humanitarian Policy
and Conflict Research
Harvard University

Population Projections for Socioeconomic Development in the Gaza Strip

Working Paper No. 1

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Acknowledgments

This working paper, the first in a series under the Gaza 2010 project, lays the groundwork for subsequent human security studies by examining the fundamental issue of population growth, an aspect of population dynamics that has considerable impact on employment and social services planning. By producing population projections and estimating future needs in the employment and social services sectors, this paper provides baseline information that is essential to proactive and viable development planning.

The results presented here are the culmination of collaboration between the Program on Humanitarian Policy and Conflict Research (HPCR) and the Palestinian Central Bureau of Statistics (PCBS). This cooperation ensured high quality projections while also building the Bureau's capacity in demography, providing an opportunity for mutual learning and capacity building. These projections, however, should not be considered final until officially sanctioned by PCBS, which will update them over time as additional information becomes available to ensure the most reliable projections possible for proactive and effective social sector planning.

The lead author of this working paper, Dr. Ismail Lubbad, HPCR Research Coordinator in the Gaza Strip, extends special appreciation to his co-authors, Professor Allan Hill and Dr. Cari Jo Clark, and to the Palestinian Central Bureau of Statistics for their collaboration on these projections. The authors would like to express gratitude to Dr. Marwan Khawaja of the American University in Beirut and the rest of the members of the Scientific Advisory Group of the Gaza 2010 project – Dr. Hoda Rashad, Dr. Nader Fergany, and Professor Philippe Fargues – for their scientific support during the elaboration of this paper. In addition, the authors express gratitude to Claude Bruderlein, Director of HPCR, and Angharad Laing, HPCR Project Associate, for their comments, contributions, and editorial assistance.

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Introduction

By all accounts, demographic pressures in the Gaza Strip — in terms of population density, age structure, and growth rate — are extraordinarily high compared to neighboring countries and regions. This population pressure, combined with limited resources and territorial isolation, places immense strain on public services, social and political institutions, and the natural environment. At the same time, insecurity resulting from a deteriorating political context leads to further poverty and unemployment. Together these conditions require both immediate attention and long-term development planning, both of which are, admittedly, difficult in an environment of continuing political uncertainties.

Since September 2000, the Gaza population has suffered periods of protracted closure imposed by the Israeli authorities. This has had deleterious consequences on the socioeconomic situation in the Gaza Strip [1, 2]. Currently, 30.3% of the Gazan workforce is unemployed [3]. Concomitantly, poverty is rampant. As of 2004, 37.2% of Gazan families were below the poverty line,[1] 26.0% of whom experienced extreme poverty[2] [4] suggesting that the majority of poor households in Gaza are unable to meet their most basic needs. These challenges to human security are exacerbated by the fact that approximately 64% of the Gaza population are refugees [5], approximately half of whom still reside in camps [6, 7].

Planning for improved services in the Gaza Strip is made more difficult by variance in the projections of the future population. For example, the Palestinian Central Bureau of Statistics (PCBS) estimates that the population of the Gaza Strip in mid-2004 was 1.3 million [8]. Other estimates suggest a smaller population at 1.06 million [9]. This difference of 240,000 persons is further magnified in population projections, resulting in significantly larger estimate differences over time hindering accurate and effective economic and social sector planning. Furthermore, the political nature of population size and growth in the occupied Palestinian territory (oPt) and Israel [10, 11] leaves decision makers without an accurate and objective set of estimates on which to make their decisions.

Therefore, this study seeks to address this knowledge gap by collaborating with PCBS to update their population projections for the Gaza Strip using cohort component techniques. This methodology provides information on the future population by age and sex, a level of detail necessary for effective economic and social service planning. Demonstrating this usage, the projections are subsequently applied to the employment, education, and health sectors to forecast the population's needs in an effort to provide information for proactive planning. It is hoped that this knowledge will assist the Palestinian Authority, United Nations agencies, donor governments, and non-governmental organizations to address the unique human security challenges of the Gaza Strip.

[1] Based on expenditure on food, clothes, housing, health care, education, transportation, personal care, and household items.
[2] Based on expenditure on food, clothing, and housing only.

Methods and Assumptions

This study used the cohort component method [12] to project the population of the Gaza Strip from 1997 (the most recent census) to 2010. This method requires baseline data by age and sex, which is then subjected to a series of assumptions about likely changes in fertility, mortality, and migration over time. The assumptions for future trends in these components (fertility, mortality, and migration) were based on an examination of historical data. These assumptions were entered into specialized demographic software (MORTPAK Version 4) to obtain the projections. Each component of this analysis is presented below, including a description of its historical trends and assumptions about these trends into the future. Preceding this discussion, however, is the necessary first step, which is to describe the base population (1997 census), the quality of the data, and the techniques used to improve the data's quality.

Base population

The population projections are based on the 1997 census conducted by the Palestinian Central Bureau of Statistics [13], which represents the only census conducted since that of the Israeli authorities in 1967.

The base population for the projections was approximately *de facto* defined as the number of individuals who were in the Gaza Strip the night of the census (December 9, 1997) regardless of their citizenship. Persons represented in the base population include:

- persons present on census day including foreigners;[3]
- unmarried persons studying abroad irrespective of the study period;
- persons whose usual place of residence was the Palestinian Territory but who were temporarily living abroad for less than one year from the night of the reference date; and
- persons detained in Israeli jails, regardless the detention period.

The base population was then adjusted by 1.016 to account for an undercount that had been identified by a post-enumeration survey conducted by PCBS. Finally, the figures were adjusted to reflect the mid-1997 population; this population for the Gaza Strip population was estimated to be 995,571 persons (see Appendix for details).

Fertility

As the primary engine of population growth, accurate knowledge of fertility and fertility trends in Gaza are essential. This analysis focuses on one of the most common measures of fertility, the Total Fertility Rate (TFR).[4]

Estimate at baseline. Published estimates of the total fertility rate for the baseline year (1997) stem

[3] Foreigners were included since most were Egyptian and Jordanians who were married to Palestinians and therefore usual residents contributing to the births and deaths in Gaza. For both the West Bank and Gaza in 1997, the total number of non-Palestinians enumerated was only 4053.

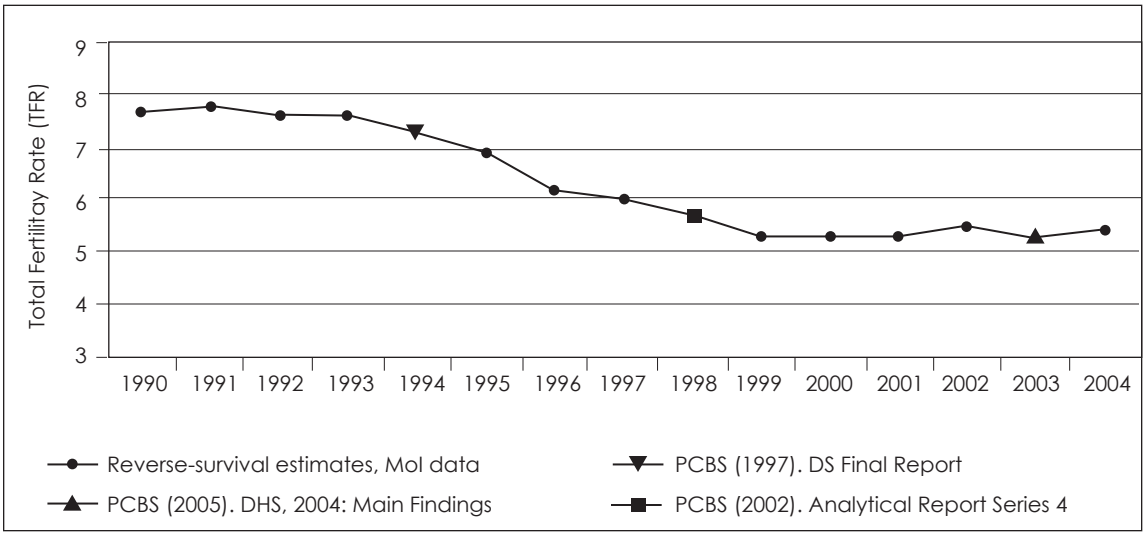
[4] The TFR is the number of children a woman would have if she survived at least until the end of her reproductive years and she experienced throughout her reproductive life the age specific fertility rates prevailing during the year in question.

from the Ministry of Health, a health survey conducted by PCBS in 2000 [14], and data from the Palestinian Population Register. The calculations of the total fertility rates published by the Ministry of Health are not standard and are therefore incomparable to other direct estimates of total fertility. They will not be used in this projection. The health study provides a direct estimate of total fertility rate for 1997. This estimate (5.4 births per woman), however, covers a period of three years from 1997-1999 [14]. Since the rate spans this time period, the TFR for 1997 was calculated from Population Register data provided by the Ministry of Interior on births in the year 2004. This register is considered high quality, because for an infant to get an identification number, the birth has to be declared and registered in one of the offices of the Ministry of Interior, which is connected directly to the Central Registration in Gaza City and controlled by the Israeli Authority. In addition, an ID card is required in order to access basic services such as education and health, travel, and employment. There is, it seems, a strong incentive to register all new births with the Ministry of Interior and to obtain an ID card. By applying the reverse-survival method to the birth data from the year 2004, the estimated TFR in 1997 is 6.[5] TFRs using this method were also calculated back to the year 1990 to investigate trends in fertility.

Trends. Results of the reverse-survival method demonstrate a downward trend in TFR from approximately 7.7 children per woman in 1990 to 6 in 1997 (Figure 1). Furthermore, following a rapid decline in the 1990s, the total fertility rate was reasonably stable between 2000 and 2004. This trend is supported by other PCBS surveys demonstrated in Figure 1 with TFRs between 5.0 and 6.0 since the late 1990s.

Assumptions. Since it is uncertain whether fertility will continue at its current rate or will decrease in the near future, the population projections were based on three alternative scenarios of future fertility in the Gaza Strip.

Figure 1 – Direct Estimates of the Total Fertility Rate Over Time, Gaza Strip



[5] For this exercise, number of children by age of mother female ages 15-49 was derived from the Population Register of the Palestinian Ministry of Interior between in 2004.

1. The first scenario assumes stable fertility between 2003 and 2010. The TFR for this assumption is set at 5.8, a figure based on the most recent PCBS survey – the 2004 Demographic and Health Survey [15].

2. The second scenario assumes that fertility will decrease slowly between 6 and 5. If this occurs, the TFR is expected to move from 5.8 currently to 5.5 children per woman in 2010.

3. The third scenario proposes a decline in the total fertility rate by 50% between 2003 and 2030, leading to a TFR of 4.8 in 2010.

Mortality

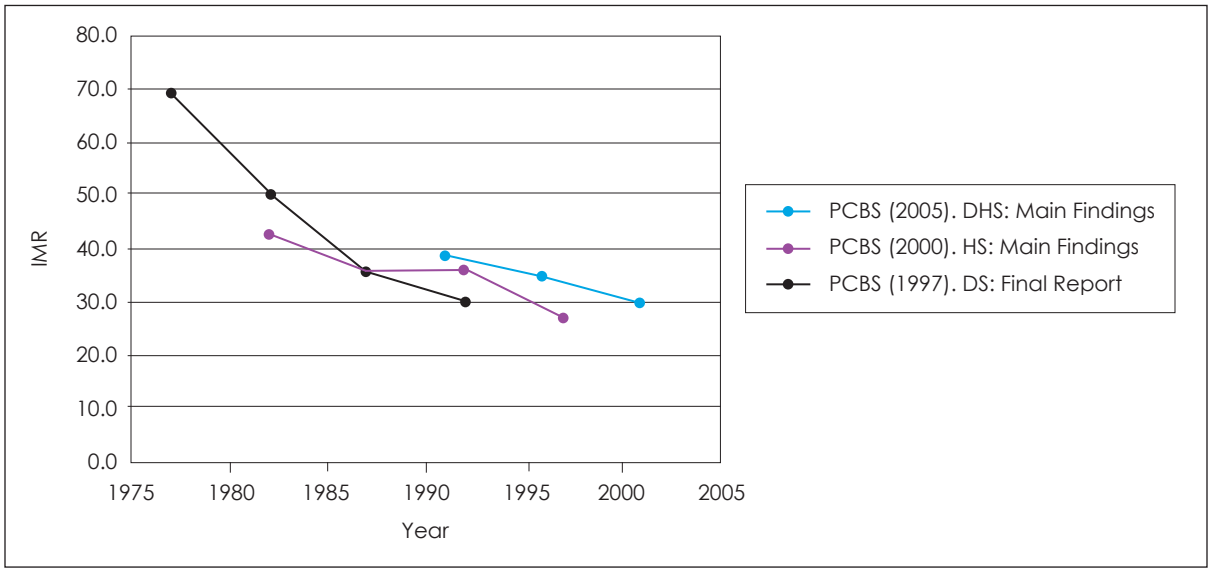
Although fertility outweighs mortality in its impact on population projections in the Gaza Strip, mortality assumptions in the form of life expectancies must be accurate to ensure the most reliable population projections available. Life expectancies at birth are normally found in a life table. A life table uses mortality data at each major age group to determine life expectancy at each age. Life expectancy at birth requires a full life table and hence mortality rates at each major age group.

Estimates at baseline. The only source of adult mortality information is the number of deaths divided by the estimated population. To ascertain the completeness of the data, the Brass Growth Balance method was applied to data for the years 1999 and 2000, the earliest years available since the death data before 1999 were deleted from the registers before being handed over to the Palestinian National Authority. The application of the Brass Growth Balance method produced confusing results.[6] The age composition for men in particular is affected by migration. Matching the unadjusted adult death rates to model life tables suggests that adult mortality for both males and females is much higher than that for children. If the adult deaths are recorded incompletely, then the corrected death rates will push even higher the difference between the death rates of children and adults. Since this possibility clearly requires more investigation, infant mortality rates were used to estimate full life tables using the UN General model, which closely matches the Princeton West model used previously. These life tables provided the requisite life expectancies at birth.

Published estimates of the infant mortality rate (IMR) at baseline stem from PCBS surveys and the Ministry of Health. According to Ministry of Health Annual Reports, the IMR was 20.3/1,000 live births for the year 1997 [16]. This figure, however, depends primarily on the quality of death registration, which is likely to be of good quality for those who die in hospitals but less so for deaths that occur in private homes. In addition, the incentive to maintain refugee benefits provides a disincentive to death reporting. Therefore, the PCBS surveys are the most accurate estimates of the IMR around baseline. The 2000 Health Survey provides a direct estimate of infant mortality for the period 1995-1999 (27.3/1000 live births) [17]. The 2004 Demographic and Health Survey provides the other estimate at 35.1/1,000 live births for the period 1994 to 1998 [15]. The two estimates are for similar time periods, but the estimate from the Demographic and Health Survey is based on a longer period of backward projection from the survey date. Therefore, the IMR from the 2000 Health Survey (27.3/1000 live births) was chosen

[6] The detailed analysis of adult mortality is the subject of a separate analysis.

Figure 2 – Direct Estimates of the Infant Mortality Rate Over Time, Gaza Strip



to estimate life expectancy at baseline using the MATCH function in Mortpak. This function provided a baseline estimate of 72 years, which was assumed to represent a 70 year life expectancy at birth for men and a 74 year life expectancy for women. The two life expectancies were assumed to be different since women live longer than men in almost every country in the world.

Mortality trends. Infant mortality has been in a strong downward trend for some time, although the most recent estimates suggest that the slope of this downward trend might be tapering off (Figure 2).

The most recent estimate of infant mortality from the 2004 Demographic and Health Survey was 30.2 for the period 1999–2003 [15], suggesting that infant mortality may be rising. However, additional data points are needed to confirm this trend.

Assumptions. Infant mortality will not likely improve much beyond the pre-Intifada levels (27.2 / 1,000 live births) used as the baseline for this projection since a large fraction of infant deaths are neonates and future reductions will require timely access to tertiary care and more careful management of pregnancy. In the current political circumstances, it is likely that, at best, infant mortality levels will be maintained in the 25-30 per 1,000 live births for the near future. Therefore, for the projections, 27.2 per 1,000 live births was used to estimate life expectancy at birth for the year 2010. Since the same estimate is being used for both the beginning and end of the projection, the life expectancies are the same, 70 for men and 74 for women.

Migration

Forced migrations are the heart of the Palestinian question. In the Gaza Strip, two-thirds of the population are refugees with rights, according to UN General Assembly Resolution 194, to either return to their original homes or to be compensated. Therefore, migration is a politically charged issue, affecting the veracity of the estimates, which differ by source.

The current migration balance depends on the source of data. Between 1997 and 2003, Israeli sources report negative migration of 15,000 individuals, while the Palestinian Central Bureau of Statistics estimates a positive migration of 18,000 individuals. Further, the Palestinian Ministry of Civil Affairs indicates that in 2004, the net difference between the number of arrivals and the number of departures was negligible.

This study relied on PCBS migration estimates, which amounted to approximately 18,000 persons between the years 1997 and 2000, and a zero net migration between 2001 and 2010. The migration estimates for the year 1997 were disregarded, as nearly all would have been counted in the 1997 census, which occurred in December. Furthermore, the estimates per year were adjusted back by half a year to arrive at mid-year estimates. These totals were distributed by the following age and sex pattern, which was based on the sex of returnees during the same time period (Table 1).

Table 1 – Age-Specific Migration Based on Age and Sex of Returnees, 1997–2000

Age groups	Male	Females
0-4	0.075	0.076
5-9	0.143	0.145
10-14	0.136	0.140
15-19	0.123	0.145
20-24	0.108	0.134
25-29	0.100	0.086
30-34	0.065	0.072
35-39	0.054	0.061
40-44	0.052	0.047
45-49	0.046	0.032
50-54	0.040	0.023
55-59	0.025	0.014
60-64	0.016	0.010
65-69	0.009	0.007
70-74	0.004	0.003
75-79	0.002	0.002
80+	0.002	0.002
Total	1.000	1.000
Source: PCBS March 22, 2006		

Table 2 – Population in the Gaza Strip (in Thousands), 1997-2010

	1997	2004	2005	2006	2007	2008	2009	2010
Male	504	653	676	700	725	751	779	807
Female	491	634	657	680	704	730	756	783
Total	996	1,287	1,333	1,380	1,429	1,481	1,535	**1,590**
TFR	6.0	5.74	5.70	5.66	5.62	5.58	5.54	5.5
Annual growth rate	3.4	3.5	3.45	3.45	3.45	3.45	3.48	3.5

Results

Regardless of the scenario, the total population of the Gaza Strip will increase from approximately 995,571 in mid-year 1997 to approximately 1.6 million in the year 2010. The three fertility scenarios produced very similar results due to the short time frame of forward projection. Therefore, only the primary projection, which assumes a drop in fertility to 5.5 by 2010, is displayed in Table 2. Obvious from the table is the consistent increase in population even though fertility is decreasing steadily. For example, *even if fertility declines to 33% of its value in 2003*[7] *(5.8 children per woman* [15]*), the population will double in size by 2028*[8]. This 'population momentum' is due to the large numbers of women entering and moving through their reproductive years.

This population growth, however, is not occurring uniformly across the different age groups. A disaggregated analysis of the population by age and sex provides fundamental information for economic and social sector planning since the different age

Table 3 – Population by Age and Sex, Gaza Strip, 2005–2010

	2005		2006		2008		2010	
Age groups	Males	Females	Males	Females	Males	Females	Males	Females
0-4	117,700	112,861	122,040	117,005	131,425	125,967	141,998	136,065
5-9	101,434	97,265	102,770	98,570	108,650	104,249	116,858	112,119
10-14	98,410	94,433	99,819	95,785	100,466	96,388	101,183	97,085
15-19	80,792	77,465	85,644	82,166	93,440	89,723	98,137	94,265
20-24	60,151	57,660	62,910	60,326	70,561	67,715	80,430	77,272
25-29	49,119	47,163	51,259	49,215	55,492	53,288	59,805	57,464
30-34	39,725	37,876	41,268	39,465	44,737	42,983	48,794	46,952
35-39	33,303	30,975	34,306	32,193	36,630	34,779	39,386	37,650
40-44	27,902	25,220	29,003	26,253	31,022	28,411	32,888	30,713
45-49	21,003	19,585	22,404	20,707	25,007	22,857	27,366	24,902
50-54	14,670	14,667	15,528	15,355	17,701	17,078	20,374	19,202
55-59	10,178	11,405	10,999	11,955	12,533	13,060	13,978	14,209
60-64	6,544	8,776	6,909	9,083	7,972	9,853	9,431	10,834
65-69	5,396	7,518	5,322	7,500	5,402	7,656	5,795	8,070
70-74	4,572	6,325	4,640	6,473	4,611	6,594	4,444	6,550
75-79	2,938	4,213	3,018	4,380	3,194	4,724	3,379	5,065
80+	2,307	3,386	2,392	3,583	2,562	3,994	2,734	4,418
Total	676,144	656,794	700,230	680,013	751,405	729,319	806,982	782,835

[7] This is the most recent estimate of the TFR from the 2004 Demographic and Health Survey.
[8] Assuming zero migration.

Table 4 – Projected Dependency Ratios, Gaza Strip, 1997–2010

	1997	2000	2004	2005	2006	2007	2008	2009	2010
Total population (in thousands)	996	1,118	1,287	1,333	1,380	1,429	1,481	1,534	1,590
Child population aged 0-14 (in thousands)	501	551	609	622	636	651	667	685	705
Adult population aged 15-64 (in thousands)	465	534	643	674	707	741	775	809	844
Elderly population aged 65+ (in thousands)	29	33	36	37	37	38	39	40	40
Dependency ratio	1.14	1.09	1.00	0.98	0.95	0.93	0.91	0.90	0.88

groups have different needs. Table 3 displays the population over time by five-year age groups.

Another more succinct means of investigating the age distribution is by regrouping these five-year age groups into major life stages (child, adult, and elderly). This regrouping provides the information needed to calculate the dependency ratio,[9] a measure of the relative weight of the young/elderly population to the working age population. This ratio declines over time, but remains very high (Table 4).

Placing this number in context provides an even greater understanding of the dependency burden faced in Gaza. Nowhere in the world, except for Africa, are there dependency ratios of a similar size (Table 5).

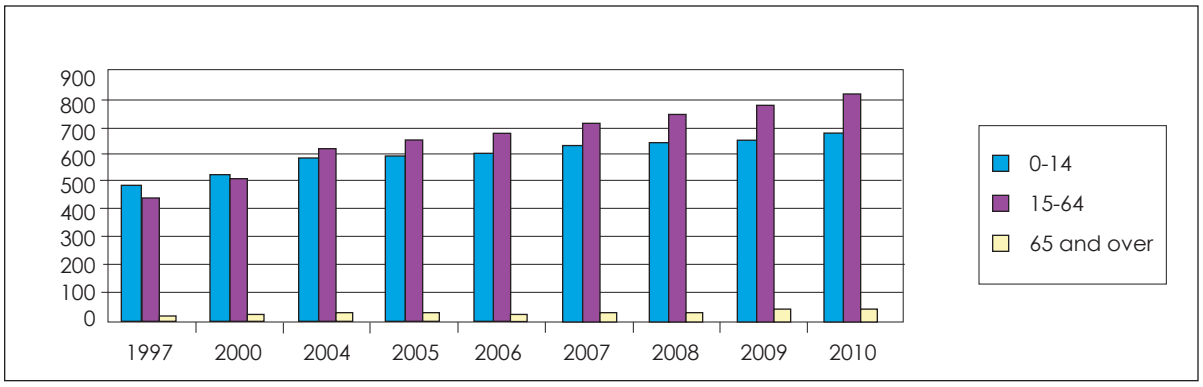
However, the dependency ratio will decrease over time (Table 4), potentially giving rise to a 'demographic dividend [19].' This dividend comes in the form of reduced burden on the working age population, a reduction that carries with it potential social and economic benefits stemming in

Table 5 – Dependency Ratios for the World and Major Regions, 2003

World and Regions	Population (millions)				Dependency Ratio
	Total	0-14	15-64	65+	
World	6,314	1,824	4,035	454	0.56
Africa	868	363	475	29	0.83
Latin America and the Caribbean	546	168	346	32	0.58
Northern America	324	68	217	40	0.50
Europe	729	120	496	113	0.47
Oceania	32	8	21	3	0.55
Asia	3,815	1,098	2,480	237	0.54
Source: Calculation based off data in Table 2 of the Demographic Yearbook 2003. UN Statistics Division [18]					

[9] Formally, the dependency ratio is calculated as the population below fifteen and above sixty-four divided by the population between fifteen and sixty-four multiplied by 100, i.e. , $d = \frac{N_{0\text{-}14} + N_{65+}}{N_{15\text{-}64}}$ where N is population and the subscript indicate the age group.

Figure 3 – Population by Age Group, Gaza Strip, 1997–2010



part from a larger workforce.[10] Figure 3 demonstrates the growth in the working age population over time compared to that of the dependent age groups. In Gaza, the projected size of the adult population (age 15 and above) is expected to increase by about 24% during the period from 2005–2010. This increase is higher than the projected increase of 19% for the whole population in the same period.

An increase in the relative size of the adult population has both advantages and disadvantages. The possible disadvantages are severe. In the Gaza Strip, job opportunities are already limited and the current labor market is severely overloaded. Therefore, an increase in the size of the adult population will lead to an even greater demand for jobs. In the absence of the appropriate policy environment and available jobs, this demand will become greater unemployment. If significant progress is made over the next five years towards economic development in the Gaza Strip, an increase in the adult population will be an advantage in that job seekers will be available to fill any new jobs created, boosting production.

While the positive and negative impacts of the dependency ratio and absolute size of the population can be theorized, projected needs of the population can be estimated in concrete terms using the results of the population projection. Understanding the future needs of the population is essential to forward looking planning that facilitates the positive potential of the population while mitigating the negative.

The employment, education, and healthcare sectors were chosen for the projection based in large part on the expressed needs of the Gazan population. In rank order, respondents to a recent PCBS survey listed food, work, money, housing, education, and healthcare as priority needs [20]. While this analysis does not address the necessity of food and housing, it does project population needs in terms of employment, education, and healthcare. These projections demonstrate the magnitude of the employment and social sector needs in Gaza. Further analyses within each sector are required for detailed sectoral planning.

[10] See Khawaja and Pederson, "The Palestinian Population of the West Bank and Gaza Strip: Current characteristics and future growth," 1998. "Thus, a moderate decline in fertility coupled with zero migration will eventually produce a "demographic gift" within thirteen years from now. However, in comparative perspective the ratio is still considered high, but the 'gift' would not be dismissed as minor in the year 2010 compared to the most recent past."

Demand for employment

The labor market crisis continues to date, fueled in large part by closure as noted previously. The current labor force participation rate (LFPR) in the Gaza Strip is only 36.5% of the working age population, due in large part to the very youthful population and low participation among women (9%) [21]. In addition, approximately 30% of the workforce is unemployed [3].

In the coming five years, it is expected that more women will enter the formal labor force. This is indicated by the fact that large percentages of the students currently enrolled in higher education are women. For example, women represented

Table 6 – Projected Labor Force and Employment Demands by 2010, Gaza Strip

	Projection	2005	2006	2007	2008	2009	2010
Size of total labor force (thousands)	LFPR= 40% by 2010[11]	254	275	293	312	333	354
	LFPR stable at 36.5%	254	272	284	297	310	323
New jobs required* (thousands)	LFPR= 40% by 2010	97	118	136	155	176	197
	LFPR stable at 36.5%	97	115	127	140	153	166

* Includes 21,000 discouraged workers for the year 2005 [23]

Table 7 – Projected School Age Population by Age and Sex, Gaza Strip, 2005-2010

	2005		2006		2008		2010	
Age	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**
6	20,167	19,339	20,922	20,073	22,566	21,652	24,195	23,207
7	19,535	18,727	20,154	19,329	21,714	20,841	23,310	22,365
8	20,438	19,592	19,523	18,719	20,897	20,054	22,540	21,633
9	20,356	19,520	20,427	19,585	20,132	19,314	21,692	20,825
10	20,224	19,403	20,346	19,513	19,504	18,705	20,878	20,041
11	20,055	19,245	20,215	19,396	20,409	19,572	20,115	19,302
12	19,803	19,005	20,046	19,239	20,328	19,501	19,488	18,694
13	19,427	18,644	19,794	18,999	20,197	19,384	20,392	19,560
14	18,900	18,136	19,418	18,638	20,028	19,226	20,310	19,489
15	18,192	17,455	18,889	18,129	19,774	18,986	20,178	19,371
Sub-total (6-15)	**197,097**	**189,067**	**199,734**	**191,619**	**205,549**	**197,234**	**213,099**	**204,487**
16	17,292	16, 587	18,181	17,448	19,395	18,624	20,006	19,213
17	16,231	15,563	17,280	16,580	18,865	18,115	19,750	18,972
Sub-total (16-17)	**33,523**	**32,150**	**35,460**	**34,028**	**38,260**	**36,739**	**39,756**	**38,185**
Total	**230,620**	**221,217**	**235,194**	**225,647**	**243,809**	**233,973**	**252,854**	**242,672**

[11] LFPR increase gradually from 2005 to reach 40% in 2010.

56% of the 17,052 students enrolled at the Islamic University of Gaza in 2004. [22]. However, there is little evidence to suggest the magnitude of this change. For these projections, the change is assumed to be none. Therefore, the projection is the minimum number of jobs required.

The projection (Table 6) is based on two assumptions: one, labor force participation rises to 40% (approximating pre-Intifada figures) by 2010, and two, labor force participation remains as in 2005 (36.5%).

In the coming five years, as shown in Table 6, the labor force will increase by at least 24%. The number of labor force participants will increase from about 254,000 in 2005 to between 323,000-354,000 by the year 2010, depending on the projected labor force participation rate.

In the coming five years, 166,000-197,000 new jobs need to be available to reach full employment in the Gaza Strip. *In order to reach 10% unemployment by 2010, 135,000 to 162,000 new jobs, according to the LFPR, would be required.*

Demand for education services

In the Gaza Strip, education is provided by three separate authorities: UNRWA, public educational institutions and private educational institutions.[12] The scholastic system is organized in stages. Students aged 6-15 are enrolled in ten years of basic education, which is followed by two years in the secondary stage for students aged 16-17. Table 7 presents a detailed projection of the school age population by age and sex.

Table 8 presents a detailed projection of the needs for teachers, classrooms, and schools, based on current conditions and a scenario based on a comparison with West Bank education services.

Using the enrolment ratio of students in 2004 (95%) [24] as a base, *the number of students would increase from about 429,000 in 2005 to about 471,000 by the middle of 2010* (without taking migration figures in consideration). In order to maintain current levels of service, *this increase of 42,000 students will require an additional 1,517 teachers and 984 classes by 2010.*

Table 8 – Projected Number of Teachers, Classes, and Schools Required by 2010, Gaza Strip

	Projection	2004	2005	2006	2007	2008	2009	2010
New teachers required	Current situation[13]	-	-	313	609	901	1,197	1,517
	West Bank level[14]	-	5,561	5,984	6,385	6,781	7,182	7,616
New classes required	Current situation[15]	-	-	203	395	584	776	984
	West Bank level[16]	-	3,434	3,705	3,961	4,215	4,472	4,749
New schools required	No double shift	362	376	386	394	400	403	404

[12] UNRWA operates fifty-eight per cent of Gaza Schools and it enrolls about forty-five per cent of the total pupils in the Gaza Strip. In this projection, we did not estimate the total expenditure on education as we propose to conduct a separate detailed quantitative and qualitative study of education services in the Gaza Strip subsequent to this paper.
[13] Estimation of new teachers required, based on Teacher-Pupil Ratio in year 2004 (Gaza Strip) 27.36 pupil/teacher.
[14] Estimation of new teachers required, based on Teacher-Pupil Ratio in year 2004 (West Bank) 20.20 pupil/teacher.
[15] Estimation of new classes required, based on Class-Pupil Ratio in year 2004 (Gaza Strip) 42.2 pupil/class.
[16] Estimation of new classes required, based on Class-Pupil Ratio in year 2004 (West Bank) 31.55 pupil/class.

This estimation of new teachers required by 2010 does not take into account the fact that some current teachers will retire over the next five years. Furthermore, *in order to bring the levels of service up to those in the West Bank, far more teachers and classrooms would be required: about 7,500 teachers and 4,700 classes will be needed simply to match availability in the West Bank*.

Another indicator of the quality of education is the use of double shift schools. In a double shift school, one school building is used by two sets of students, teachers, and administrators. One set uses the building in the morning, and the other uses the building in the afternoon. In 2004, about 72% of the schools in the Gaza Strip operated in double shifts, compared with 9% in the West Bank [24]. *In order to operate all schools in one shift, the Gaza Strip will require 376 schools immediately*.

Demand for health services

The healthcare needs of the population were projected in terms of human and physical capital (physicians, nurses, hospital beds, and primary health centers) (Table 9). Needs in terms of these four health resources were projected using the coverage rates in 2003 for the Ministry of Health [25]. These were 14.5, 17.8 and 15.8 per 10,000 inhabitants for the first three indicators respectively and 8.5 primary health centers per 100,000 inhabitants.

By examining the trends of services needs in the coming five years, Table 9 *demonstrates a need for 425 new physicians, 520 nurses, 465 hospital beds, and 132 primary health centers by the year 2010*.

Table 9 – Projected Number of Physicians, Nurses, Primary Health Centers, and Hospital Beds by 2010, Gaza Strip

	2003	2004	2005	2006	2007	2008	2009	2010
New physicians required	-	-	65	131	200	272	348	425
New nurses required	-	-	79	160	244	332	425	520
New hospital beds required	-	-	71	143	218	297	380	465
New PHC required	-	-	3	7	11	15	20	24

Conclusions and Recommendations

The population of the Gaza Strip will grow to at least 1,590,000 by the year 2010, and is expected to be double its current size by 2028. Similarly, the age structure of the population is expected to shift somewhat over the next few years. *By 2010, the adult population will have grown by 24%, increasing in size relative to the child population and putting additional pressure on the job and housing markets*. Regardless of migration, population trends are and will be one of the main determinants of socio-economic development in the Gaza Strip.

The Gaza Strip population, even with an immediate decline in fertility, will continue to grow for a generation due to 'population momentum.' This effect, resulting from the size of the upcoming cohorts, will engender population growth for many years to come.

The prospect of a growing population and shifting age structure puts pressure on public services, such as education and healthcare. In the area of education, in order just to respond to the population growth without any improvement in the quality of services, 1,517 additional teachers and more than 984 new classrooms will be required by 2010. In order to bring education resources up to the level of the West Bank, the Gaza Strip will need more than 7,500 additional teachers and 4,700 new classrooms immediately. Finally, in order to maintain current levels of access to health services, the Gaza Strip will require 425 additional physicians, 520 additional nurses, 465 new hospital beds by the year 2010.

Based on these preliminary research results, it appears that, *unless immediate and large-scale improvements* are made to the economy in Gaza, *unemployment levels are expected to rise sharply over the next five years. Over 135,000 new jobs will be needed by 2010 to accommodate the workforce at 10% unemployment*. In this context, it is expected that large numbers of these new workers will be forced to leave the Gaza Strip to find employment elsewhere. If the borders are closed and emigration is not an option, the Gaza Strip can expect a breakdown of its already fragile public services infrastructure and, potentially, a dramatic increase in violence and instability.

A major shift in focus towards increasing socioeconomic development and freer movement of population in the Gaza Strip over the coming five years will be one of the main contributors to stability and peace in Gaza.

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Appendix

The Base Population

The base for all projections is the census of December 1997. This base population has been adjusted in several ways to take account of both statistical imperfections and administrative circumstances.

Population under study. The population of interest is all those regarded as usual residents of the Gaza Strip regardless of nationality defined as:

- persons present on census day including foreigners;[17]
- unmarried persons studying abroad irrespective of the study period;
- persons whose usual place of residence was the Palestinian Territory but who were temporarily living abroad for less than one year from the night of the reference date; and
- persons detained in Israeli jails, regardless the detention period.

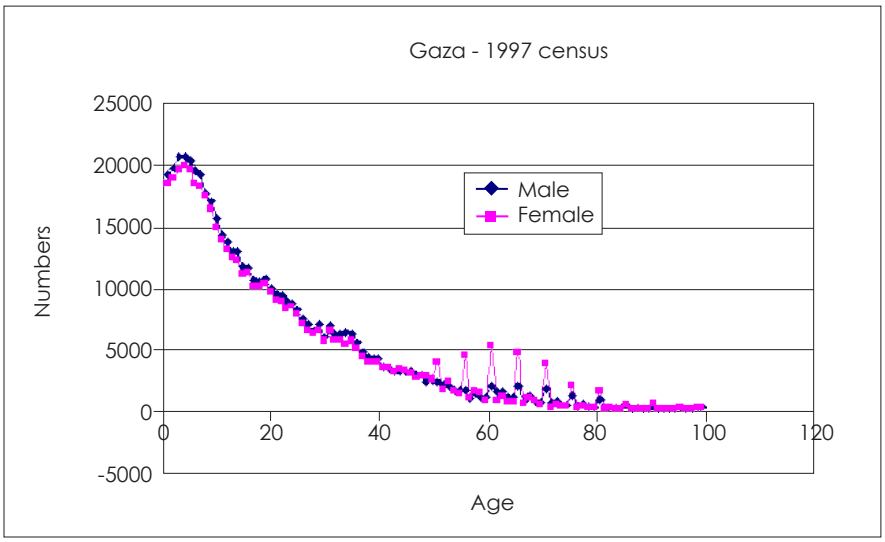
Table 10 – Unadjusted Census Population in December 1997 Used as Basis for Projections

Age Groups	Males	Females	Total
0-4	100,887	96,683	197,570
5-9	89,261	85,529	174,790
10-14	65,693	62,384	128,077
15-19	53,138	50,961	104,099
20-24	44,431	42,150	86,581
25-29	33,495	31,698	65,193
30-34	31,730	28,556	60,286
35-39	22,612	20,533	43,145
40-44	16,156	16,289	32,445
45-49	13,304	13,103	26,407
50-54	8,957	10,216	19,173
55-59	5,542	8,535	14,077
60-64	6,612	7,886	14,498
65-69	4,825	6,863	11,688
70-74	3,492	4,608	8,100
75-79	2,013	2,278	4,291
80+	2,223	2,782	5,005
Total	504,371	491,054	995,425

Age adjustments. As in most censuses, we find some evidence of omissions and age misreporting, usually most pronounced amongst the young and old. For the elderly, mostly women, we see the familiar saw-tooth pattern associated with rounding of ages to the nearest multiple of 5 or 10 (Figure 4). This will be managed using a simple smoothing procedure.

[17] Foreigners were included since most were Egyptian and Jordanians who were married to Palestinians and therefore usual residents contributing to the births and deaths in Gaza. For both the West Bank and Gaza in 1997, the total number of non-Palestinians enumerated was only 4053.

Figure 4 – Reported Age Distribution from the 1997 Census of Gaza



For the under ten, the question is whether the children's ages were over-estimated or whether the children were left out of the census entirely. Both features are common on censuses worldwide. To answer this question, we examined the births before the census from the population registers. These registers are maintained by the Israeli Ministry of Interior in consultation with the Palestinian Ministry of Interior and are thought to be more complete than the births recorded by the Ministry of Health. At birth, two copies of the birth certificate are completed and one copy sent to the Ministry of Interior, the other to the Ministry of Health. Due to the importance of an identify card for travel and access to services (especially important in the case of registered refugee for access to UNRWA services), the Ministry of Interior records are thought to be the most accurate and best maintained. The comparison of the annual number of births recoded in the registers with the population by single years of age in the census reveals a very close match (Figure 5).

Figure 5 – The Gaza Census Age Distribution and Births Before 1997

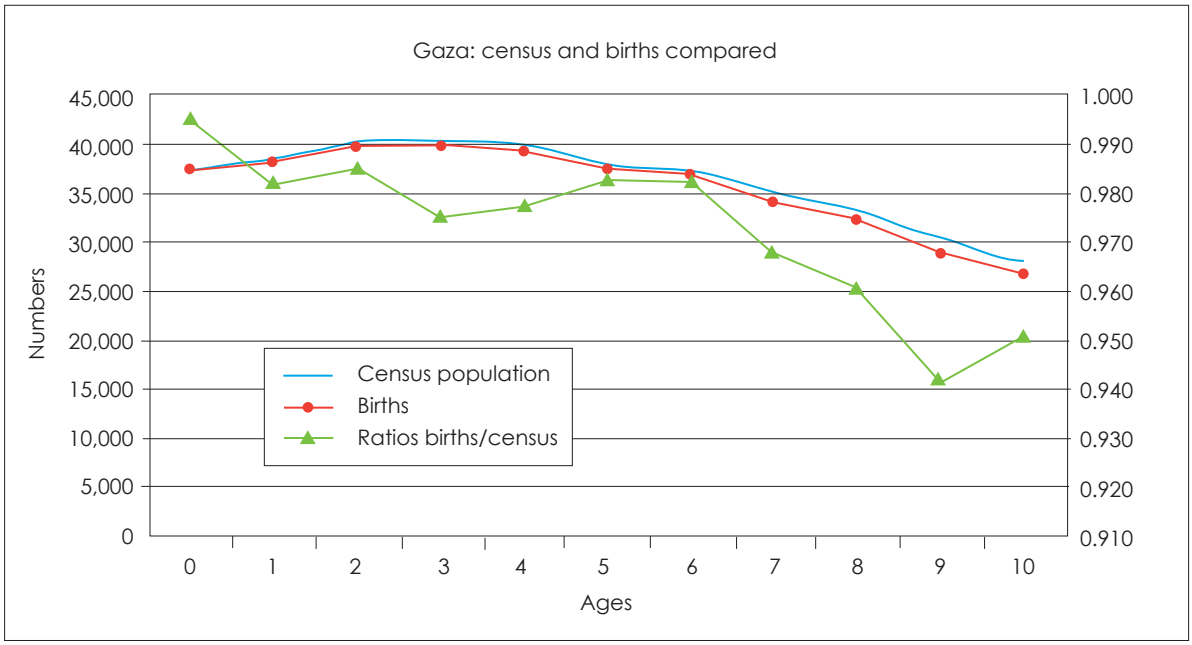


Figure 6 – Annual Births in Gaza from the Population Registers

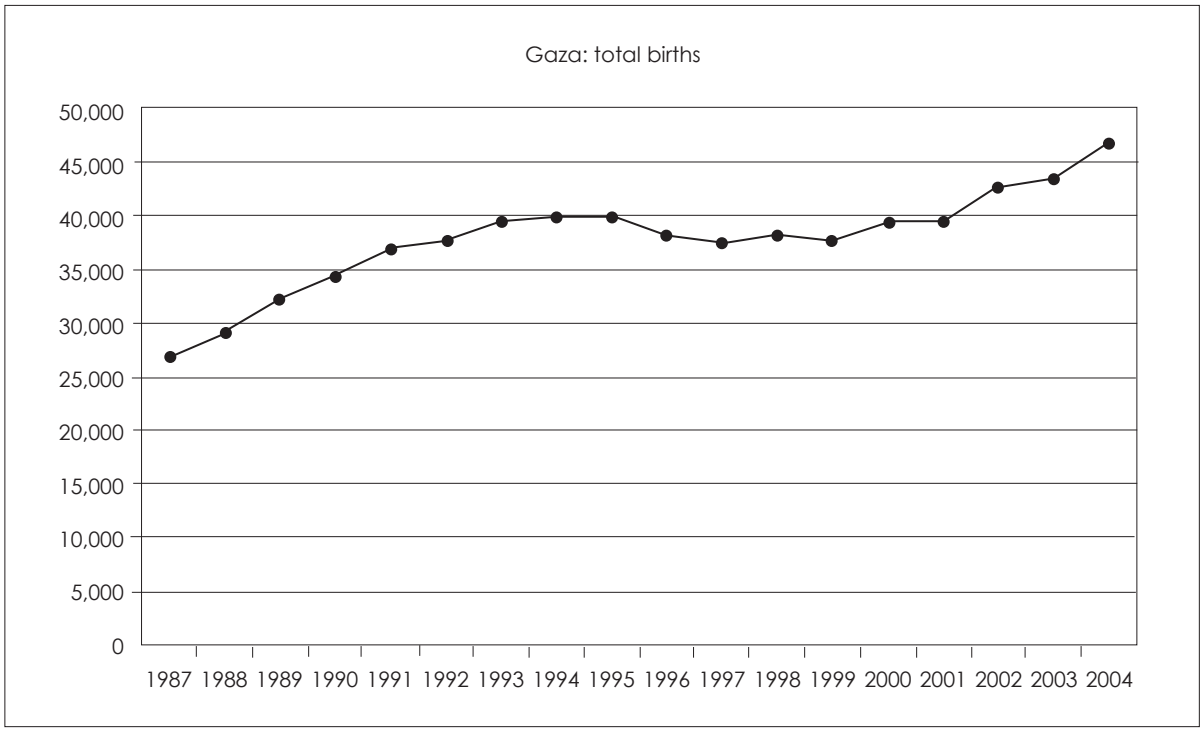


Table 11 – Post-Census Estimates of the Under-Enumeration by Governorate, Gaza Strip

Age Groups	Males	Females	Total
0-4	105,256	100,938	206,194
5-9	84,892	81,274	166,166
10-14	65,796	62,833	128,629
15-19	53,035	50,512	103,547
20-24	42,633	40,633	83,266
25-29	35,293	33,215	68,508
30-34	30,227	27,218	57,445
35-39	24,115	21,871	45,986
40-44	17,014	16,403	33,417
45-49	12,447	12,989	25,435
50-54	8,128	10,152	18,280
55-59	6,371	8,599	14,970
60-64	6,340	8,197	14,537
65-69	5,097	6,553	11,649
70-74	3,614	4,587	8,200
75-79	1,891	2,299	4,191
80+	2,223	2,782	5,005
Total	504,371	491,054	995,425

In the circumstances, it seems that the census data are a superior source of information on the numbers of children under ten in the population than the births for the ten years before the census. From the trend in the numbers of births, we have to recognize that in Gaza, in particular, there was a temporary drop in the number of births just before the census and lasting several years after this (Figure 6). This fluctuation in fertility will have to be reflected in the base age distribution. Some slight smoothing only is recommended.

In conclusion, we propose to use the census age distribution of those under ten for the projections since this distribution follows very closely the registered births with some small allowance for child deaths between birth and enumeration in 1997.

For the age distribution as a whole, we have used a light smoothing technique to address the serrated age pattern for older men and women. The procedure chosen, the Arriaga method, is widely accepted as a means to correct obvious age misreporting problems that should not be allowed to affect the future age distributions in the projections. The results of this smoothing are shown in Table 11.

Post census adjustment for the undercount. As in all census operations, some households and individuals are missed during the enumeration process. In a post-enumeration coverage survey covering a representative sample of enumeration areas, the following coverage rates were derived:

Table 12 – The Census Population of Gaza Smoothed Using the Arriaga Method

Governorate	Coverage (%)
North Gaza	98.63
Gaza	98.25
Deir al-Balah	98.31
Khan Younis	98.39
Rafah	98.43
Gaza - all	98.38

As can be seen, coverage rates were extremely high (Table 12). Given the small variations in coverage rates by governorate, it was decided to adjust upwards the data for Gaza by 1.016 (1/.9838). The resulting population distribution adjusted for both age misreporting and the undercount is shown in Table 13.

Table 13 – The Adjusted Gaza Population, December 1997

Age Groups	Males	Females	Total
0-4	102,501	98,230	200,731
5-9	90,689	86,897	177,587
10-14	66,849	63,839	130,687
15-19	53,884	51,320	105,204
20-24	43,315	41,283	84,598
25-29	35,858	33,746	69,604
30-34	30,711	27,653	58,364
35-39	24,501	22,221	46,722
40-44	17,286	16,666	33,952
45-49	12,646	13,196	25,842
50-54	8,258	10,315	18,573
55-59	6,473	8,736	15,209
60-64	6,442	8,328	14,770
65-69	5,178	6,657	11,835
70-74	3,671	4,660	8,332
75-79	1,922	2,336	4,258
80+	2,259	2,827	5,085
Total	512,441	498,911	1,011,352

Mid-year adjustment. This population, however, represents the population on census night, almost an end of year count. In order to shift the age distribution back in time to mid-year 1997, the population was back-projected to mid-1997 using the procedure MOVEPOP provided in the set of programs published by the US Census Bureau. The baseline total fertility rate (6 children per woman) and IMR (27.3/1,000 live births) were used as the assumptions for this shift. The baseline population used for the projections is presented in Table 14.

Table 14 – The Gaza Population Shifted to Mid-Year 1997

Age Groups	Males	Females	Total
0-4	100,902	96,697	197,599
5-9	89,274	85,541	174,815
10-14	65,805	62,842	128,647
15-19	53,043	50,520	103,563
20-24	42,640	40,638	83,278
25-29	35,298	33,220	68,518
30-34	30,232	27,221	57,453
35-39	24,118	21,874	45,992
40-44	17,017	16,406	33,423
45-49	12,448	12,990	25,438
50-54	8,129	10,154	18,283
55-59	6,372	8,600	14,972
60-64	6,342	8,198	14,540
65-69	5,097	6,553	11,650
70-74	3,614	4,588	8,202
75-79	1,892	2,299	4,191
80+	2,224	2,783	5,007
Total	504,447	491,124	995,571

About HPCR

The Program on Humanitarian Policy and Conflict Research at Harvard University (HPCR) was set up in 2000 with a view to serve international organizations with research and policy input on humanitarian law, human security, conflict management, and conflict prevention.

The Program is engaged in research and advisory services on conflict prevention strategies, the management of humanitarian crises and the protection of civilians in conflict areas. It advises international organizations, governments and non-governmental actors, and focuses on the protection of vulnerable groups, conflict prevention strategies, and the role of information technology.

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The Program rests on the joint efforts of the Harvard School of Public Health, the Federal Department of Foreign Affairs of Switzerland, and the Executive Office of the United Nations Secretary-General, and it seeks to cooperate closely with operational and academic institutions around the world.

About Gaza 2010

Gaza 2010: Assessing Human Security Needs in the Gaza Strip is a project of the Program on Humanitarian Policy and Conflict Research at Harvard University (HPCR). The project aims to assess the current human security situation in the Gaza Strip and evaluate the projected public needs of the Palestinian population in terms of key services and employment. The overall objectives of this initiative are the improvement of scientific knowledge about the projected needs of the population in the Gaza Strip, the promotion of dialogue on poverty mitigation policies, and improved planning for public services.

To these ends, the project conducts targeted applied research into the sources of human insecurity in Gaza, organizes capacity building activities with partner organizations in the occupied Palestinian territory, and creates opportunities for dialogue among the project's key constituents: local social scientists, policy planners, and decision makers. Through all of its activities, this initiative seeks to identify specific mechanisms for improved planning for human security, based on a better understanding of the population and social dynamics involved.

The research findings of Gaza 2010 are designed to be of immediate relevance to professionals and practitioners working with these issues, including international donors and agencies, the Palestinian ministries of health, housing, planning, education, labor, and finance, and those agencies and research centers interacting with them. Furthermore, it is believed that lessons learned in the process of making a human security assessment of the Gaza Strip will be applicable in the future in other areas of the occupied Palestinian territory and in the region as a whole. To ensure the effective and dynamic sharing of information, HPCR will set up an electronic information platform (www.gaza2010.org) that will offer reports, data, analysis, and relevant news pertaining to the issue of human security in Gaza.

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