Birth Outcomes and Childbirth-related Behavior in Korea

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Introduction

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Introduction

A. Research Background

Under the family system based on legal marriage, the relationship between marriage and birth in Korea is regarded as very high. As the educational period for women has lengthened and female employment rates have gone up, the delay in marriage has essentially led to a rise in the average maternal age at delivery (Statistics Korea, 2011).

Maternal age at delivery is a main factor that affects the growth and health of fetuses. In particular, in the case of pregnancy and delivery among women aged 35 or older, mothers or babies are more likely to be exposed to diseases or deaths than those in normal cases, with the risk of complications before and after childbirth rising. In this context, such cases have been thought of as high-risk pregnancy (Mark et al., 1999). In other words, in case those older than 35 get pregnant, the risk of maternal deaths soars, more frequently inducing undesirable birth results such as low birth weight, preterm birth, stillbirth and unexplained fetal deaths due to complications such as hypertension and gestational diabetes whose occurrence is proportional to age (Aldous & Edmonson, 1993; Tough et al, 2002; Delbaere et al, 2007; Fretts, 2005; Silver, 2007).

On the other hand, as infertility treatment technologies have

advanced and the government's subfertile couple support project has been implemented, the number of pregnancies through artificial fertilization or external fertilization has also grown. Infertility has been known to be equally caused by problems of men or women and unidentified reasons comprehensively related to women and men. In particular, in the case of women, the relationship between age and subfertility rates has been often observed, with the subfertility rate rapidly rising for women aged 35 or older (Menken et al., 1986).

The rising age at delivery affects the number of infertility treatments and the increase in the number of treated pregnancies. In relation to the subfertile couple support project of the government, the number of beneficiaries aged 35 or older has also rapidly grown (Ministry of Health and Welfare, 2009). In addition, in the case of artificially-inseminated or external-inseminated pregnancies, the occurrence of triplets or more has recently been reduced due to the development of diverse treatments, but still recording a high level of twins delivery rates. They have functioned as the main elements that increase the number of high-risk neonates exposed to premature birth, low birth weight and birth defects (Ministry of Health and Welfare, 2010).

The Korean government has enhanced the survival rate of high-risk newborns exposed to preterm birth or low birth weight through medical technology advancement, expansion of intensive care units for newborns, and medical expense support for preterm birth. As a result, infant mortality in Korea has continuously fallen, ranking in the top 10 among OECD nations (OECD, 2011). However, given that preterm birth or low birth weight

is mainly caused by growth delay in the womb or birth defects, it is hard to believe that their survival can lead to health recovery. In some cases, such treatments work just as a factor that delays death for a moment, with such diseases or disabilities remaining in their lives (Kramer, 1987).

Since 2000, the rate of premature or under-weight births has consistently grown. However, the government has been satisfied with falling infant mortality, failing to pay enough attention to the effect of disabilities or treatment demand on future population quality or related social burden. As the subfertile couple support project, which is part of low birth management scheme, has been implemented since the year 2006 and is showing signs of expansion, the rate of occurrence of high-risk newborns from rising multiple births is likely to go further up, expanding the magnitude of the issue.

The reason why not enough attention has been paid to the rising high-risk newborns and the ripple effects from treatment prognosis is that the government has focused only on childbirth and that there is not enough substantial data for sharing undesirable birth results from changes in delivery behaviors. In response, considering that preterm birth or the occurrence of low birth weight infants has expanded mainly due to rising maternal age and the expansion of subfertility treatment, this research is designed to provide related information in order to make it possible to identify the effect and future direction thereof, and thereby encourage the government and the public to give more attention to the promotion of the health of mothers/newborns directly related to population quality.

B. Materials and Methods

This research was conducted based on data gathering and analysis through the existing nationwide reporting on childbirth-related behaviors/the health of newborns, sample household interviews, and hospital data research. In addition, in relation to women in pregnancy or a lying-in period, the recognition of and attitude towards the relationship between the health of infants and maternal age were identified and used.

With respect to delivery-related behaviors, this research used 1) the marriage statistics reporting of Statistics Korea based on population trends reporting, 2) performance in the government project for supporting subfertile couples, 3) the nationwide sample household birth history, family health/welfare research, and marriage/delivery trends research, and 4) pregnant women survey results. Gestational weeks, birth weight, plurality, and birth defects, key newborns health-related indicators, were used in relation to the health of newborns. Finally, 1) the birth statistics reporting of Statistics Korea based on population trends reporting, 2) infant and maternal deaths research data, and 3) the birth defect prevalence data for neonates born in 2005~2006 were employed in relation to the deaths of newborns. (Refer to Table 1-1).

〈Table 1-1〉 Research Materials

Type	Title	Period	Source
Reporting	KOSIS (Marriage, Birth and Death)	1990~2010	Statistics Korea
Performance Report	Annual Report of Health Insurance Statistics	1998~2009	National Health Insurance Corporation
	Infertility Support Program	2006~2009	Ministry of Health & Welfare(MIHW)
National Household Survey	Family Health and Welfare Survey	1991~2009	Korea Institute for Health and Social Affairs (KIHASA)
	Survey on Trends in Marriage and Childbirth	2005, 2009	MIHW, KIHASA
National Hospital Survey	Survey on Infant and Maternal Death	Babies born in 1996~2007	MIHW, KIHASA
	Survey on Congenital Anomalies	Babies born in 2005~2006	MIHW, KIHASA
other	Pregnant Women Survey	June, 2011	This Study

Chapter

02

Changes in Childbirth-related Behavior

Chapter 2

Changes in Childbirth-related Behavior

A. Age at Marriage

In 2010, the number of out-of-wedlock births in Korea reached 9,639, accounting for 2.1% of the total newborns. The number of births outside marriage has continuously risen, but most births have still been within marriage. Therefore, the effect of age at marriage on maternal age is regarded as very significant. (Refer to Table 2-1).

〈Table 2-1〉 Live births, by marital status, 1990~2010

(Unit: %)

Marital Status	1990	1995	2000	2005	2010
married	99.1	98.8	98.9	97.8	97.5
Unmarried	0.9	1.2	0.9	1.5	2.1
(N)	(6,151)	(8,748)	(5,540)	(6,459)	(9,639)
Unknown	0.0003	0.003	0.3	0.7	0.4
Total	100.0	100.0	100.0	100.0	100.0
(N)	(649,738)	(715,020)	(634,501)	(435,031)	(470,171)

Sources: Statistics Korea. KOSIS (http://www.kosis.kr), 2011

In 2010, the age at first marriage was 31.8 for men and 28.9 for women, rising by about four years both for men and women from the figures in 1990. As a result, in the distribution of the ages at first marriage for women, the proportion of those in their 20s significantly dropped from 89.7% in 1990 to 64.5%

in 2010, while the proportion of those in their 30s have consistently risen to account for 33.6% in 2010 (one out of three). The proportion of those aged 35 or older have also risen from 1.4% in 1990 to 7% in 2010. (Refer to Table 2-2).

⟨Table 2-2⟩ Age at First Marriage of Woman, 1990~2010

(Unit: %)

Age(y)	1990	1995	2000	2002	2005	2006	2007	2008	2009	2010
<20	4.8	3.6	2.9	2.2	2.3	2.8	2.2	2.4	2.1	2.1
20~24	51.5	44.5	29.7	24.9	18.9	17.6	15.5	13.7	11.9	11.6
25~29	38.2	44.9	55.4	57.0	56.8	56.6	57.6	56.8	55.6	52.9
30~34	4.2	5.2	9.3	12.8	17.7	18.5	19.7	21.5	24.0	26.4
>34	1.4	1.8	2.8	3.0	4.3	4.6	5.1	5.6	6.4	7.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average	24.78	25.32	26.49	27.01	27.72	27.79	28.09	28.32	28.71	28.91

Sources: Statistics Korea, KOSIS(http://www.kosis.kr), 2011

Taking into account the research on the recognition of the ideal marriage age or the desired age at marriage by the socio-population characteristic of unmarried women, such trends are expected to continue. In other words, according to the 2009 study, the maximum value of the ideal marriage age for unmarried women exceeded 35 in all age groups. Five to eight percent of those aged 35 or older responded that the ideal marriage age is 35 or older, showing that their delay in marriage can be attributed to not missing a chance for marriage but to their own choice (Refer to table 2-3).

〈Table 2-3〉 Ideal Age at Marriage for Unmarried Women, by Age, 2005 vs 2009

(Unit: Years)

Age(y)	Ideal Age at Marriage							
	Mean		Maximum		Median		35 or older (%)	
	2005	2009	2005	2009	2005	2009	2005	2009
20~24	27.99	28.49	35	38	28	28	0.3	0.3
25~29	28.83	29.25	35	36	29	30	0.3	1.3
30~34	29.43	29.73	40	36	30	30	4.7	5.1
35~39	28.79	29.72	35	35	29	30	2.8	8.1
40~44	29.10	29.61	32	40	30	30	0.0	6.1
Total	28.44	28.95	40	40	28	29	0.8	1.7
(N)	(1,200)	(1,569)						

Sources: Sam-shik Lee et al(2005, 2009). Survey on Trends in Marriage and Childbirth. KIHASA·Ministry of Health and Welfare

Furthermore, in terms of the desired age at marriage compared to the ideal marriage age, a majority of those in their 20s said that the desired age of marriage was over 30. Such a trend was more clearly witnessed in 2009 than in 2005 (Refer to Table 2-4).

〈Table 2-4〉 Desired Age at Marriage for Unmarried Women, by Ideal Age at Marriage, 2005 vs 2009

(Unit: %)

Year	Ideal Age(y)	Desired Age at Marriage					
		20~24	25~29	30~34	35 or older	Total	(N)
2005	20~24	20.0	40.0	40.0	-	100.0	(5)
	25~29	0.8	72.8	22.9	3.5	100.0	(621)
	30~34	-	19.2	71.5	9.2	100.0	(239)
	>34	-	-	20.0	80.0	100.0	(5)
	Total	0.7	57.5	36.3	5.5	100.0	(870)
2009	20~24	22.2	33.3	44.4	-	100.0	(9)
	25~29	0.3	62.3	33.5	3.9	100.0	(636)
	30~34	-	11.1	78.1	10.9	100.0	(442)
	>34	-	-	10.0	90.0	100.0	(20)
	Total	0.4	40.5	50.9	8.2	100.0	(1,107)

Sources: Sam-shik Lee et al(2005, 2009). Survey on Trends in Marriage and Childbirth. KIHASA·Ministry of Health and Welfare

Those employed or looking for a job showed higher ideal ages for marriage than those not employed or looking for a job. Such a trend has intensified between 2005 and 2009, revealing that the rise in women's employment increased the age at marriage. (Refer to Table 2-5).

〈Table 2-5〉 Ideal Age at Marriage for Unmarried Women, by State of Employment, 2005 vs 2009

(Unit: %)

| Year | Ideal Age(y) | Employed | Unemployed | | Total |
			job-hunting	no job-hunting	
	Total	100.0	100.0	100.0	100.0
2005	20~24	3.5	3.3	4.2	3.7
	25~29	73.5	74.7	78.5	75.0
	30~34	22.3	21.2	17.0	20.7
	>34	0.8	0.8	0.3	0.6
	(N)	(1,591)	(363)	(706)	(2,660)
2009	20~24	0.5	1.1	1.5	0.9
	25~29	56.7	60.7	64.5	59.9
	30~34	41.1	37.7	33.4	38.0
	>34	1.7	0.5	0.5	1.1
	(N)	(1,728)	(379)	(1,170)	(3,277)

Sources: Sam-shik Lee et al(2005, 2009). Survey on Trends in Marriage and Childbirth. KIHASA·Ministry of Health and Welfare

B. Maternal Age

In relation to the rise in women's employment, self-realization, higher educational level, and low birth rates, late childbearing are fount to have increased across the world. The trend has been more clearly seen in high income countries. In particular, increases in age at first delivery has been noted (Ventura et

al., 2009; Carolan, 2003).

A similar trend has also been witnessed in Korea. Between 1993 and 2010, the average maternal age rose regardless of birth order. The degree of growth is in inverse proportion to birth order. The maternal age for the first child grew by about four years from an average of 26.2 in 1993 to 30.1 in 2010 (Refer to Table 2-6).

⟨Table 2-6⟩ Average Age of Mother at Birth, by Birth Order, 1993~2010

(Unit: Years)

Birth Order	1993	1995	1999	2000	2002	2005	2008	2009	2010
Total	27.6	27.9	28.7	29.0	29.5	30.2	30.8	31.0	31.3
First	26.2	26.5	27.4	27.7	28.3	29.1	29.6	29.9	30.1
Second	28.5	28.7	29.4	29.7	30.2	31.0	31.7	31.8	32.0
Third	31.2	31.6	32.1	32.2	32.7	33.3	33.8	33.9	34.0
Fourth or up	33.8	34.2	34.4	34.5	34.9	35.3	35.7	35.7	35.8

Sources: Statistics Korea. KOSIS (http://www.kosis.kr), 2011

The risk of late childbirth has been known to be the highest for the first child. In 2010, one in every ten first births were to women aged over 35 (Refer to Table 2-7).

⟨Table 2-7⟩ Age of Mother at First Live Birth, 1993~2010

(Unit: %, Years)

Age(y)	1993	1995	1999	2000	2002	2005	2008	2009	2010
<20	2.1	1.8	1.5	1.4	1.2	0.9	0.9	0.9	1.0
20~24	33.9	29.8	20.4	18.3	15.7	11.1	8.9	8.0	7.6
25~29	52.2	55.9	60.8	60.1	55.4	50.7	47.1	45.3	41.3
30~34	9.7	10.0	13.9	16.6	23.1	31.2	34.9	36.6	40.1
35~39	1.8	2.2	2.8	3.0	3.8	5.2	7.3	8.1	8.9
>39	0.3	0.3	0.5	0.6	0.8	0.8	0.9	1.0	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(average)	(26.2)	(26.5)	(27.4)	(27.7)	(28.3)	(29.1)	(29.6)	(29.9)	(30.1)

Sources: Statistics Korea. KOSIS (http://www.kosis.kr), 2011

The age at first delivery is noticeably affected by the age at marriage. The increased educational attainment and employment of women also affected delay in pregnancy. The period between marriage and the first child delivery is estimated at 1.8 years on average in 2010, up 1.6 months from the year 2000 (Statistics Korea, 2011).

Furthermore, under the circumstances where the desired age of marriage for unmarried women is higher than the ideal marriage age and looking into the desired birth following marriage by the desired age of marriage, most of the women aged 35 or older disclosed their plan to give birth. This implies that the age at first delivery may further increase in the future (Refer to Table 2-8).

〈Table 2-8〉 Expect of Childbirth following Marriage for Unmarried Women, by Desired Age at Marriage, 2005 vs 2009

(Unit: %)

Years	Expect of birth following marriage	Desired Age at Marriage(y)				
		20~24	25~29	30~34	>34	Total
	Total	100.0	100.0	100.0	100.0	100.0
2005	Be sure to have	83.3	54.1	45.4	33.3	50.0
	Want to have if possible	0.0	43.1	47.9	54.2	45.2
	Not particularly want to have	16.7	1.2	4.4	8.3	2.9
	Not want to have	-	0.4	0.3	-	0.3
	Never thought about it	-	1.2	1.9	4.2	1.6
	(N)	(6)	(499)	(315)	(48)	(868)
2009	Be sure to have	25.0	37.1	26.7	30.8	31.2
	Want to have if possible	75.0	59.3	68.9	61.5	64.4
	Not particularly want to have	-	1.6	2.5	3.3	2.2
	Not want to have	-	-	0.5	2.2	0.5
	Never thought about it	-	2.0	1.4	2.2	1.7
	(N)	(4)	(450)	(566)	(91)	(1,111)

Sources: Sam-shik Lee et al. (2005, 2009). Survey on Trends in Marriage and Childbirth. KIHASA·Ministry of Health and Welfare

On the other hand, most unmarried women said they would have a first child in marriage after they get a stable job and become financially secure. The percentage of women showing the above attitude rose from 55.7% in 2005 to 61.8% in 2009. The percentage of those who do not want to exceed the optimal childbearing age fell from 19.2% in 2005 to 12.1% in 2009. Therefore, the current high level of unemployment is likely to further increase the maternal age, along with the rising marriage age of those looking for a job (Refer to Table 2-9).

〈Table 2-9〉 Expected Time of first birth following Marriage for Unmarried Women, by Desired Age at Marriage, 2005 vs 2009

(Unit: %)

Year	Expected time of first birth	Desired Age at Marriage(y)				
		20~24	25~29	30~34	>34	Total
	Total	100.0	100.0	100.0	100.0	100.0
2005	After having a secure job	16.7	23.5	22.9	15.1	22.3
	When having enough household income	41.7	37.1	32.0	25.8	33.4
	After buying a house	-	2.2	3.2	4.0	2.9
	After enjoying life with a spouse	8.3	12.2	11.5	6.7	11.2
	During the best age to give birth	25.0	18.6	19.8	18.2	19.2
	When her spouse wants to have	-	5.2	8.5	22.7	8.7
	When her parents want it	-	0.1	0.3	-	0.2
	When her parents in law want it	-	-	0.3	1.3	0.3
	Others	8.3	1.1	1.5	6.2	1.9
	(N)	(12)	(813)	(994)	(225)	(2,044)
2009	After having a secure job	50.0	33.4	34.9	29.1	33.8
	When having enough household income	-	27.0	27.4	33.2	28.0
	After buying a house	-	9.1	8.2	10.7	8.8
	After enjoying life with a spouse	-	11.2	10.6	9.7	10.6
	During the best age to give birth	25.0	13.2	12.0	10.4	12.1
	When her spouse wants to have	25.0	4.2	5.1	5.9	5.0
	When her parents want it	-	1.0	1.0	-	0.9
	When her parents in law want it	-	0.6	0.5	-	0.5
	Others	-	0.1	0.3	1.0	0.3
	(N)	(4)	(667)	(1,297)	(289)	(2,257)

Sources: Sam-shik Lee et al. (2005, 2009). Survey on Trends in Marriage and Childbirth. KIHASA·Ministry of Health and Welfare

In the circumstances where the maternal age is going up, the percentage of high-risk delivery of those aged 35 or older in Korea is currently maintained at 14%, but which is projected to exceed 20% in the future, as in the UK, Australia, Japan, et al. (Refer to Table 2-10).

〈Table 2-10〉 International Comparison of Maternal Age, 2008

Maternal Age(y)	UK	Australia	Japan	Korea
Median(y)	29.3	30.7	29.5	30.0
35~39	17.0%	21.4%	18.4%	12.8%
40~44	3.2%	3.4%	2.6%	1.4%

Sources: Australian Bureau of Statistics, 2008; Laws and Hilder, 2008; Ministry of Internal Affairs and Communication, 2009; Office of National Statistics, 2008; Statistics Korea, 2009

C. Infertility Treatment

Infertility or subfertility refers to the status where married women fail to get pregnant for about one year (those aged 35 or older -> six months) even though they try to conceive or the case where the pregnancy is not maintained until a baby is born. The number of such cases is known to rise as women get older, skyrocketing among women aged 35 or older.

One-third of married women aged 35 or older in the US are estimated to experience subfertility. In addition, the success rate of subfertility treatment is reported to have sharply fallen as women got older (younger than 35 -> 41%; 35~37-> 32%; 38~40->22%; 41~42 ->12%; 43~44->5%) (CDC, 2009).

As of the year 2003, the subfertility rate of married women in Korea is estimated at 13.5%. However, in accordance with health insurance treatment performance, the number of women diagnosed with infertility was 114,000 in 2005, 132,000 in 2006, and 139,000 in 2007, falling short of the above estimation, showing that the level of infertility has yet to be accurately identified. Furthermore, according to the nationwide sample household

survey, the infertility treatment rate of married women was estimated at only 5.0%, raising the possibility of infertility treatment expanding in the future (Refer to Table 2-11).

〈Table 2-11〉 Infertility Checkup for Married Women, by Age, 2005 vs 2009

(Unit: %)

Year	Infertility Checkup	20~24y	25~29y	30~34y	35~39y	40~44y	Total
	Total	100.0	100.0	100.0	100.0	100.0	100.0
2005	Yes	1.5	6.8	10.0	6.6	6.9	7.6
	No	98.5	93.2	90.0	93.4	93.1	92.4
	(N)	(68)	(440)	(1,039)	(1,163)	(1,059)	(3,769)
2009	Yes	2.5	3.8	5.5	5.9	4.2	5.0
	No	97.5	96.2	94.5	94.1	95.8	95.0
	(N)	(40)	(372)	(816)	(1,152)	(1,149)	(3,529)

Sources: Sam-shik Lee et al. (2005, 2009). Survey on Trends in Marriage and Childbirth. KIHASA·Ministry of Health and Welfare

On the other hand, in order to reduce the economic burden of subfertile couples, the Korean government has supported part of artificial fertilization or external fertilization expenses since the year 2006 for women in low-income brackets aged 44 or younger (western age). As a result, by the year 2009, about 65,000 women underwent the operation through the program (Ministry of Health and Welfare, 2009).

The birth rates through the subfertile couple support project continuously rose from 21.3% in 2006 and 23.6% in 2007 to 25.5% in 2008. By age, the rates were gradually reduced from those in their 30s, showing a very low level among those aged 40 or older, as in the case of the US (Refer to Table 2-12).

〈Table 2-12〉 Outcomes of Infertility Treatment Support Projects, by Age, 2008

(Unit: Case, %)

Age(y)	Treatment (A)	Result Confirmed	Results Not Confirmed	Pregnancy (B)	(B/A)x100	Births (C)	(C/A)x100
< 25	101	101	0	38	37.6	33	32.7
25~29	2,049	2,030	19	802	39.1	658	32.4
30~34	6,147	6,116	31	2,175	35.4	1,757	28.7
35~39	3,842	3,841	1	1,098	28.6	849	22.1
> 39	1,123	1,115	8	123	11.0	69	6.1
Total	13,262	13,203	59	4,236	31.9	3,366	25.5

Sources: Ministry of Health and Welfare (2010). 2010 Health Office Workshop for Infertility Treatment Support Projects

According to birth results for subfertile couple support projects, twins or more accounted for about 34% of the total, showing high multiple birth rates (Refer to Table 2-13).

〈Table 2-13〉 Births from Infertility Treatment Support Projects, by Plurality, 2006~2008

(Unit: Person)

Plurality	2006		2007		2008	
	Births	%	Births	%	Births	%
Singleton	2,663	65.8	2,240	64.8	2,207	65.6
Twins	1,365	33.7	1,201	34.8	1,149	34.1
Triplets	20	0.5	19	0.5	10	0.3
Total	5,453[1]	100.0	4,699[1]	100.0	4,535[1]	100.0

Note: 1) Including births results not confirmed
Sources: Ministry of Health and Welfare (2010). 2010 Health Office Workshop for Infertility Treatment Support Projects

Trends in Birth Outcomes

Chapter 3
Trends in Birth Outcomes

A. Health Indicators of Newborns

Diseases, disabilities and deaths are the most widely used health indicators. In particular, given that health during the neonatal period affects the general status of health throughout their whole life, more attention has been paid to the issue. Recently, the realm of health indices, which are risk factors related to diseases, disabilities and deaths, has expanded.

In relation thereto, under the leadership of WHO, each nation in the world including Korea has selected and managed essential management indices by nation for neonatal health, as part of maternal and child health care. The areas and contents of newborns health indicators differ by nation but mainly include neonatal death, severe disorders, birth defects, low birth weight, preterm birth, plurality, delayed growth in a womb, and the delivery of extremely low birth weight infants in high-risk/intensive care units. More comprehensively, the age/level of education of mothers, smoking/drinking rates during pregnancy, pre-delivery management rates in the early stage of pregnancy, establishment of medical system before/after birth, and the number of obstetricians per baby are also included as health indicators for monitoring (Refer to Table 3-1).

〈Table 3-1〉 Infant Health Indicators

Nation	Area	Indicators
USA	Morbidity and Mortality	○ Infant Mortality Rate ○ Infant deaths related to birth defects (all birth defects). ○ Infant deaths related to birth defects (congenital heart defects). ○ Low birth weight and very low birth weight ○ Preterm births (live births at 34 to 36 weeks/32 to 33 weeks of gestation)
	Disability	○ Occurrence of fetal alcohol syndrome (FAS). ○ Disorders diagnosed through newborn bloodspot screening ○ Occurrence of spina bifida. ○ Occurrence of anencephaly.
	Health Services	○ Newborn bloodspot screening and follow-up testing ○ Very low birth weight infants born at level III hospitals
	Risk Factors	○ Prenatal care beginning in first trimester ○ Abstinence from alcohol, cigarettes, and illicit drugs among pregnant women.
Canada	Birth Outcomes	○ Preterm Birth Rate ○ Small-for-Gestational-Age Rate ○ Fetal and Infant Mortality Rates ○ Multiple birth rate ○ Prevalence of Congenital Anomalies ○ Rate of Neonatal Hospital Readmission after Discharge at Birth ○ Severe Neonatal Morbidity Rate
	Risk Factors	○ Prevalence of Prenatal Smoking ○ Prevalence of Prenatal Alcohol Consumption ○ Rate of Live Births to less educated Mothers ○ Rate of Live Births to Teenage Mothers ○ Rate of Live Births to Older Mothers ○ Rate of Early Neonatal Discharge from Hospital after Birth
Japan	Morbidity & Mortality	○ Neonatal Mortality Rate
	Risk Factors	○ Prenatal care beginning in first trimester ○ Prevalence of Prenatal Smoking, Alcohol Consumption ○ Development of Perinatal care system ○ Manpower for Maternal and Child Health Care
Korea	Morbidity and	○ Infant Mortality Rate ○ Provision of Neonatal Intensive Care Units

Nation	Area	Indicators
	Mortality	
	Risk Factors	○ Newborn Health Screening - Metabolic Disorder - Hearing Difficulty ○ Prenatal care within 8 weeks of gestation

Sources: US DHHS(2010). Healthy People 2020; Ministry of Health and Welfare(2011). National Health Promotion Plan 2011~2020; Ministry of Health, Labour and Welfare (2010). Goals of Maternal and Child Health Care; Canadian Perinatal Surveillance System(2011)

Such trends are based on the fact that pregnancy, delivery and post-delivery management generally affect neonatal health. They are specifically designed to lower the occurrence of preterm birth, low birth weight infants, and birth defects and thereby to minimize the occurrence of neonatal deaths and disabilities. Furthermore, they are closely related to each other. In particular, the low birth weight rate shows the long-term poor nutrition and health of mothers in population group and the access to health care services, functioning as a key prediction factor for neonatal health and survival in individual unit. As a result, its representation as a health index has been acknowledged. Given that the newborn mortality accounts for a major portion of the deaths of infants and children and that it acts as a very useful index for measuring the health and healthcare level of mothers and newborns, it needs to be monitored separately from infant mortality (WHO, 2011). Other indicators representing the health of newborns are closely related to maternal ages. In particular, taking into account that late childbearing has risen, more attention should be paid to the index.

B. Preterm Births

The mortality of preterm babies with less than 37 weeks in pregnancy is significantly higher than that of normal newborns with 37~41 weeks in pregnancy. Small and immature babies with immature intestines are more likely to be exposed to diverse diseases such as difficulty in breathing, necrotizing enteritis and infection. In addition, long-term treatments also raise the possibility of complications such as chronic lung diseases being incurred (Wilcox et al., 1992).

The number of preterm babies rose by 1.5 times from about 18,000 in 1995 to about 27,000 in 2010. Amid a fall in the total number of newborns, the number of preterm babies per 100 newborns increased by 2.3 times from 2.5 in 1995 to 5.8 in 2010 (Refer to Figure 3-1).

〔Figure 3-1〕 Preterm Births among 100 Live Births, 1995~2010
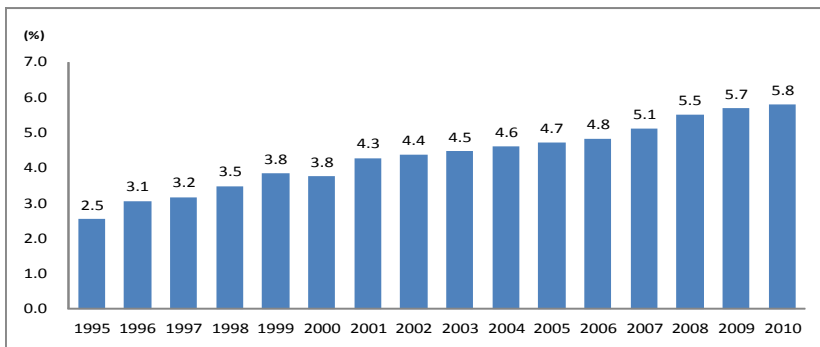
Sources: Statistics Korea. KOSIS(http://www.kosis.kr)

The rate of preterm birth with less than 37 weeks in pregnancy varies by plurality, the age of mothers, and mother's education. Multiple births showed significantly higher preterm birth rates than singletons, with the rate rapidly rising among mothers aged 35 or older. The level of education of mothers is in inverse proportion thereto (Refer to Table 3-2).

〈Table 3-2〉 Gestational Weeks of Live Births, by General Characteristics, 1999~2008

(Unit: %)

Characteristics		1999			2002		
		≥37 wks	<37 wks	(N)[1]	≥37 wks	<37 wks	(N)[1]
Total		96.14	3.86	(614,233)	95.58	4.42	(494,625)
Plurality	Singleton	96.67	3.33	(603,270)	96.31	3.69	(481,174)
	Twin or more	62.80	37.20	(9,606)	59.71	40.29	(9,696)
Maternal age(y)	<25	96.60	3.40	(87,913)	95.82	4.18	(56,527)
	25~29	96.63	3.37	(330,590)	96.28	3.72	(227,172)
	30~34	95.56	4.44	(156,003)	95.20	4.80	(170,489)
	>34	93.30	6.70	(38,082)	92.96	7.04	(39,831)
Mother's Education	Junior high or less	94.48	5.52	(30,423)	93.31	6.69	(15,492)
	High School	96.21	3.79	(370,400)	95.45	4.55	(256,107)
	College or Higher	96.28	3.72	(211,419)	95.90	4.10	(218,167)

Characteristics		2005			2008		
		≥37 wks	<37 wks	(N)[1]	≥37 wks	<37 wks	(N)[1]
Total		95.23	4.77	(438,062)	94.45	5.55	(465,892)
Plurality	Singleton	96.13	3.87	(425,368)	95.76	4.24	(450,953)
	Twin or more	55.00	45.00	(9,512)	48.87	51.13	(12,790)
Maternal age(y)	<25	95.68	4.32	(36,056)	95.00	5.00	(30,947)
	25~29	95.93	4.07	(175,551)	95.24	4.76	(168,893)
	30~34	95.08	4.92	(178,795)	94.42	5.58	(198,748)
	>34	92.83	7.17	(46,682)	92.35	7.65	(66,499)

Characteristics		2005			2008		
		≥37 wks	<37 wks	(N)[1]	≥37 wks	<37 wks	(N)[1]
Mother's Education	Junior high or less	93.15	6.85	(10,203)	93.23	6.77	(10,498)
	High School	94.88	5.12	(182,694)	93.89	6.11	(158,899)
	College or Higher	95.59	4.41	(240,895)	94.82	5.18	(292,457)

Note: 1) Including cases where gestational ages are unknown.
Sources: Statistics Korea, Population Trend Report by Year

Looking into preterm birth rates related to parental ages, the rate was lowest among the age group between 25~29, rising thereafter as parents got older. The rise in preterm birth rates was more clearly witnessed as mothers got older, rather than as fathers aged (Refer to Figure 3-2).

［Figure 3-2］ Preterm Births among 100 Live Births, by Age of Parents, 1999~2008[1]
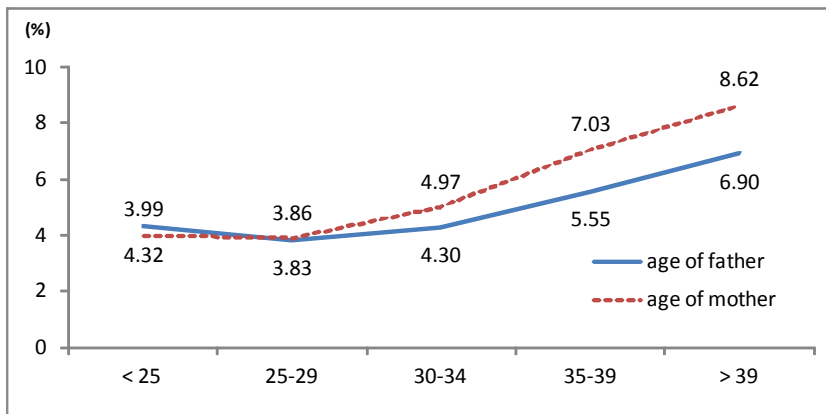
Note: 1) limited to 1999, 2002, 2005, and 2008
Sources: Statistics Korea, Population Trend Report by Year

However, preterm birth rates in 2008 compared to those in 1999 rose in all age groups, making us suspect that the general health status of the female reproductive system including fertility has dropped, not to mention a rise in maternal age (Refer to Table 3-3).

⟨Table 3-3⟩ Preterm Births among 100 Live Births, by Plurality and Maternal Age,[1] 1999~2008

(Unit: Persons)

Plurality	Maternal age(y)	1999	2002	2005	2008	Total
Singleton	<25	3.04	3.73	3.79	4.27	3.52
	25~29	2.91	3.11	3.29	3.71	3.19
	30~34	3.77	3.90	3.90	4.12	3.93
	35~39	5.60	5.91	5.66	5.69	5.71
	>39	7.21	7.18	8.09	8.21	7.72
	Total	3.33	3.69	3.86	4.24	3.74
Twin or more	<25	34.70	41.78	44.91	55.03	41.60
	25~29	36.74	40.24	44.69	52.68	43.09
	30~34	37.28	40.31	44.71	50.19	44.31
	35~39	41.59	40.06	46.70	50.50	46.29
	>39	41.67	35.65	47.62	51.38	45.51
	Total	37.18	40.30	45.01	51.11	43.98
Total	<25	3.40	4.18	4.32	5.00	3.99
	25~29	3.37	3.72	4.07	4.76	3.86
	30~34	4.44	4.80	4.92	5.58	4.97
	35~39	6.53	6.92	6.93	7.43	7.03
	>39	7.90	7.78	8.87	9.58	8.62
	Total	3.86	4.42	4.77	5.54	4.58

Note: 1) Excluding cases where plurality and maternal age are unknown.
Sources: Statistics Korea, Population Trend Report by Year

The relative risk ratio of preterm birth rate by plurality, maternal age, mother's education, and region from 1999 to 2008 is as follows. In the case of plurality, the risk of preterm birth of

multiple births was 16.7 times higher than that of preterm birth of singletons in 1999. The figure then soared to 23.5 times in 2008. By maternal age, regarding the age group between 25~29 as a baseline, the risk of preterm birth was significantly higher among the other age groups in the following order: 35 or older, 30~34, and 24 or younger. By the level of education of mothers, regarding university graduates or higher as a baseline, the risk of preterm birth was significantly higher among the other groups in the following order: middle school graduates or lower and high school graduates (Refer to Table 3-4).

⟨Table 3-4⟩ Odds Ratios[1] of Birth Outcome-related Factors for Preterm Birth[2], 1999~2008

Classification		1999			2002		
		OR	95% C.I.		OR	95% C.I.	
			Lower	Upper		Lower	Upper
Plurality	singletons	1.00			1.00		
	Twin or more	16.71***	15.99	17.46	17.29***	16.55	18.06
Maternal Age(y)	25~29	1.00			1.00		
	<25	1.03	0.99	1.08	1.13***	1.08	1.19
	30~34	1.27***	1.23	1.32	1.23***	1.19	1.27
	>34	1.95***	1.86	2.04	1.78***	1.70	1.87
Mother's Education	College or Higher				1.00		
	Junior high or less				1.50***	1.39	1.61
	High school				1.14***	1.11	1.17
Region	Seoul	1.00			1.00		
	Busan	0.92***	0.86	0.98	0.97	0.91	1.04
	Daegu	1.16***	1.08	1.23	1.06	0.99	1.13
	Incheon	1.05	0.98	1.12	1.09*	1.02	1.16
	Gwangju	0.94	0.87	1.02	1.08	0.99	1.17
	Daejeon	0.88***	0.81	0.96	0.97	0.89	1.06
	Ulsan	1.15***	1.06	1.25	1.10	1.00	1.20
	Gyeonggi	1.03	0.99	1.07	0.97	0.92	1.01
	Gangwon	1.31***	1.22	1.41	1.04	0.96	1.14
	Chungbuk	0.96	0.88	1.04	0.94	0.86	1.02

Classification		1999			2002		
		OR	95% C.I.		OR	95% C.I.	
			Lower	Upper		Lower	Upper
	Chungnam	0.94	0.87	1.01	0.99	0.91	1.07
	Jeonbuk	0.84	0.77	0.90	0.91*	0.84	0.99
	Jeonnam	1.01***	0.94	1.09	1.11**	1.03	1.19
	Gyeongbuk	1.11***	1.04	1.18	1.08*	1.01	1.16
	Gyeongnam	0.95*	0.89	1.01	0.95	0.89	1.01
	Jeju	0.90	0.79	1.02	0.86*	0.76	0.99

Classification		2005			2008		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
Plurality	singletons	1.00			1.00		
	Twin or more	20.45***	19.58	21.37	23.51***	22.63	24.42
Maternal Age(y)	25~29	1.00			1.00		
	<25	1.04	0.98	1.11	1.03	0.97	1.09
	30~34	1.17***	1.13	1.21	1.10***	1.07	1.14
	>34	1.68***	1.61	1.76	1.49***	1.43	1.55
Mother's Education	College or Higher	1.00			1.00		
	Junior high or less	1.70	1.57	1.85	1.50***	1.37	1.63
	High school	1.20	1.16	1.24	1.23***	1.19	1.26
Region	Seoul	1.00			1.00		
	Busan	1.04	0.97	1.11	1.09**	1.03	1.16
	Daegu	1.13**	1.05	1.21	1.19***	1.11	1.27
	Incheon	0.99	0.92	1.07	1.07*	1.00	1.14
	Gwangju	1.07	0.98	1.17	0.99	0.91	1.08
	Daejeon	1.13**	1.03	1.23	1.07	0.98	1.16
	Ulsan	1.03	0.93	1.14	1.05	0.96	1.15
	Gyeonggi	1.01	0.96	1.05	1.05*	1.01	1.10
	Gangwon	1.16**	1.06	1.26	1.05	0.96	1.14
	Chungbuk	0.94	0.85	1.03	0.97	0.89	1.06
	Chungnam	1.03	0.95	1.12	1.06	0.99	1.14
	Jeonbuk	0.92	0.85	1.01	0.92*	0.85	1.00
	Jeonnam	1.13**	1.04	1.23	1.11**	1.03	1.20
	Gyeongbuk	1.18***	1.10	1.26	1.17***	1.09	1.24
	Gyeongnam	1.05	0.98	1.12	1.08**	1.02	1.15
	Jeju	0.94	0.82	1.08	1.02	0.90	1.16

Note: 1) Results from a Multiple Logistic Regression Analysis(Forward Stepwise method, Hosmer Lemeshow test p>0.05). Statistical Significance *: p<0.05 **: p<0.01 ***: p<0.001
2) Live birth with less than 37 gestational weeks
Sources: Statistics Korea, Population Trend Report by Year

C. Low Birth Weight

Birth weight is a key index for measuring the health and growth of infants. A birth weight of less than 2,500g, 1,500g, and 1,000g are classified into low birth weight, very low birth weight, and extremely low birth weight, respectively. Depending on the degree of low birth weight, infant mortality has rapidly grown. In particular, the combination of preterm birth and low birth weight has more sharply increased the risk of death.

The number of low birth weight infants per 100 newborns reached 4.9 in 2010, up 29% from the year 2000 (Refer to Figure 3-3).

[Figure 3-3] LBW[1] among 100 Live Births, 2000~2010
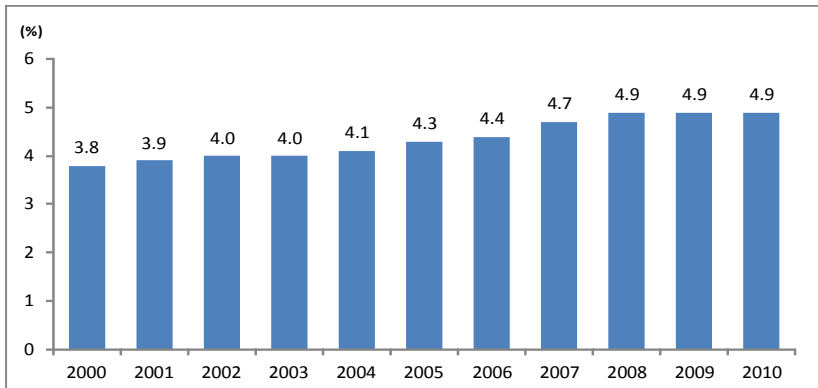
Note: 1) Low Birth Weight with less than 2,500 grams
Sources: Statistics Korea, Population Trend Report by Year

As in the case of preterm babies, low birth weight rates are significantly higher among multiple births, rapidly rising among mothers aged 35 or older. It is in inverse proportion to the level of education of mothers. It is proportional to age, with the rate

of very low birth weight (less than 1,500g) rising noticeably (Refer to Table 3-5).

〈Table 3-5〉 Birth Weight of Live Births, by General Characteristics, 1999~2008

(Unit: %)

Characteristics		1999				2002			
		<1500g	1500g ~2499g	>2499g	(N)[1]	<1500g	1500g ~2499g	>2499g	(N)[1]
Total		0.24	3.34	96.42	(614,233)	0.36	3.63	96.01	(494,625)
Plurality	Singleton	0.19	2.68	97.13	(603,270)	0.27	2.76	96.97	(481,174)
	Twin or more	3.26	44.75	51.99	(9,606)	3.73	46.43	49.83	(9,696)
Maternal age(y)	<25	0.18	3.31	96.51	(87,913)	0.31	3.56	96.12	(56,527)
	25~29	0.19	2.97	96.84	(330,590)	0.25	3.22	96.53	(227,172)
	30~34	0.31	3.61	96.08	(156,003)	0.42	3.77	95.80	(170,489)
	>34	0.54	5.49	93.97	(38,082)	0.71	5.42	93.88	(39,831)
Mother's Education	Junior high or less	0.39	5.15	94.46	(30,423)	0.55	5.66	93.79	(15,492)
	High School	0.24	3.35	96.41	(370,400)	0.34	3.79	95.86	(256,107)
	College or Higher	0.22	3.05	96.73	(211,419)	0.31	3.28	96.40	(218,167)
Characteristics		2005				2008			
		<1500g	1500g ~2499g	>2499g	(N)[1]	<1500g	1500g ~2499g	>2499g	(N)[1]
Total		0.41	3.87	95.71	(438,062)	0.50	4.40	95.10	(465,892)
Plurality	Singleton	0.33	2.93	96.74	(425,368)	0.48	4.39	95.12	(450,953)
	Twin or more	4.17	46.20	49.63	(9,512)	4.68	48.59	46.72	(12,790)
Maternal age(y)	<25	0.32	3.77	95.90	(36,056)	0.54	4.38	95.08	(30,947)
	25~29	0.32	3.45	96.23	(175,551)	0.38	3.88	95.74	(168,893)
	30~34	0.43	3.91	95.66	(178,795)	0.48	4.42	95.10	(198,748)
	>34	0.77	5.38	93.86	(46,682)	0.88	5.62	93.50	(66,499)
Mother's Education	Junior high or less	0.64	5.85	93.52	(10,203)	0.56	6.17	93.27	(10,498)
	High School	0.46	4.04	95.50	(182,694)	0.59	4.71	94.69	(158,899)
	College or Higher	0.37	3.66	95.97	(240,895)	0.42	4.15	95.43	(292,457)

Note: 1) including cases where birth weight is unknown
Sources: Statistics Korea, Population Trend Report by Year

Between 1999 and 2008, the low birth weight rate of multiple births was more than 16 times higher than that of singletons. The difference between multiple births and singletons in low birth weight rate was the biggest in the maternal age group between 25 and 29, which was reduced as the maternal age rose. This shows that in the case of late childbearing, the low birth weight rate among singletons was relatively high. Furthermore, in case the maternal age is 35 or older, the low birth weight rate among singletons dropped in 2008, compared to the year 1999 but the rate among multiple births rose, showing that low birth weight rates (natural pregnancy) fell thanks to reinforcement in predelivery management in relation to late childbearing. It also signals a rise in pregnancy through artificial or external fertilization (Table 3-6).

〈Table 3-6〉 LBW[1] among 100 Live Births, by Plurality and Maternal Age,[2] 1999~2008

(Unit: persons)

Plurality	Maternal age(y)	1999	2002	2005	2008	Total
Singleton	<25	2.93	3.23	3.50	4.01	3.26
	25~29	2.53	2.68	2.87	3.15	2.75
	30~34	3.07	3.03	3.18	3.32	3.16
	>34	4.91	4.77	4.82	4.71	4.79
	Total	2.87	3.03	3.26	3.50	3.14
Twin or more	<25	52.40	56.36	50.93	60.55	54.49
	25~29	48.24	51.13	50.98	54.85	51.10
	30~34	45.67	48.63	49.93	52.69	49.85
	>34	49.68	49.19	49.49	51.32	50.24
	Total	47.99	50.15	50.33	53.26	50.65
Total	<25	3.49	3.73	3.89	4.74	3.80
	25~29	3.16	3.46	3.76	4.25	3.56
	30~34	3.92	4.19	4.33	4.89	4.36
	>34	6.03	6.10	6.12	6.49	6.23
	Total	3.57	3.96	4.26	4.88	4.12

Note: 1) Low Birth Weight with less than 2,500 grams
2) Excluding cases where plurality and maternal age are unknown.
Sources: Statistics Korea, Population Trend Report by Year

Between 1999 and 2008, very low birth weight rates among multiple births were more than 14 times higher than those among singletons. Very low birth weight rates among singletons rose sharply in the 35 or older age group (Table 3-7).

〈Table 3-7〉 VLBW[1] among 100 Live Births, by Plurality and Maternal Age,[2] 1999~2008

(Unit: persons)

Plurality	Maternal age(y)	1999	2002	2005	2008	Total
Singleton	<25	0.15	0.24	0.27	0.28	0.21
	25~29	0.15	0.19	0.25	0.26	0.20
	30~34	0.25	0.31	0.33	0.34	0.31
	>34	0.49	0.53	0.65	0.73	0.62
	Total	0.19	0.27	0.33	0.37	0.28
Twin or more	<25	3.00	5.82	4.86	8.79	4.99
	25~29	3.35	3.80	3.88	5.14	4.00
	30~34	3.46	3.34	4.18	4.24	3.88
	>34	2.42	3.85	4.53	4.53	4.07
	Total	3.26	3.73	4.16	4.68	4.01
Total	<25	0.18	0.30	0.31	0.52	0.28
	25~29	0.19	0.25	0.32	0.38	0.27
	30~34	0.31	0.42	0.43	0.48	0.41
	>34	0.54	0.70	0.76	0.88	0.75
	Total	0.24	0.35	0.41	0.50	0.37

Note: 1) Very Low Birth Weight with less than 1,500 grams
    2) Excluding cases where plurality and maternal age are unknown.
Sources: Statistics Korea, Population Trend Report by Year

Between 1999 and 2008, the relative risk ratio of low birth weight rates by plurality, maternal age, mother's education, and region is as follows. The rates among multiple births were slightly higher than those among singletons. In the case of maternal age, the rates for the 25~29 age group were significantly lower than those for the other age groups. The level of education of mothers was in inverse proportion to low birth weight rates (Refer to Table 3-8).

⟨Table 3-8⟩ Odds Ratios[1] of Birth Outcome-related Factors for Low Birth Weight,[2] 1999~2008

Classification		1999			2002		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
Plurality	singletons	1.00			1.00		
	Twin or more	30.91***	29.61	32.27	32.28***	30.90	33.71
Maternal Age(y)	25~29	1.00			1.00		
	<25	1.11***	1.06	1.16	1.14***	1.08	1.20
	30~34	1.16***	1.12	1.20	1.10***	1.07	1.14
	>34	1.72***	1.64	1.81	1.58***	1.50	1.67
Mother's Education	College or Higher	1.00			1.00		
	Junior high or less	1.58***	1.48	1.67	1.64***	1.52	1.77
	High school	1.13***	1.09	1.16	1.19***	1.15	1.23
Region	Seoul	1.00			1.00		
	Busan	1.03	0.97	1.10	1.06	0.98	1.13
	Daegu	1.06	0.98	1.13	1.07	0.99	1.16
	Incheon	1.01	0.94	1.08	1.07	1.00	1.16
	Gwangju	1.14**	1.05	1.24	0.99	0.90	1.08
	Daejeon	0.87**	0.79	0.95	1.00	0.91	1.10
	Ulsan	1.22***	1.11	1.33	1.13*	1.02	1.25
	Gyeonggi	1.02	0.97	1.06	1.02	0.97	1.07
	Gangwon	1.19***	1.10	1.30	1.10*	1.00	1.21
	Chungbuk	1.02	0.94	1.12	1.02	0.93	1.12
	Chungnam	0.99	0.91	1.07	1.03	0.95	1.13
	Jeonbuk	0.97	0.90	1.05	1.07	0.98	1.17
	Jeonnam	0.97	0.90	1.05	1.03	0.94	1.12
	Gyeongbuk	1.12***	1.05	1.20	1.13***	1.05	1.22
	Gyeongnam	1.06	0.99	1.13	1.06	0.99	1.13
	Jeju	0.92	0.80	1.05	0.92	0.80	1.06
Classification		2005			2008		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
Plurality	singletons	1.00			1.00		
	Twin or more	30.39***	29.08	31.76	31.54***	30.35	32.79
Maternal Age(y)	25~29	1.00			1.00		
	<25	1.10**	1.03	1.17	1.12***	1.05	1.20
	30~34	1.09***	1.05	1.13	1.05**	1.02	1.09
	>34	1.51***	1.44	1.59	1.35***	1.30	1.41

Classification		2005			2008		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
Mother's Education	College or Higher	1.00			1.00		
	Junior high or less	1.86***	1.70	2.02	1.72***	1.58	1.88
	High school	1.16***	1.13	1.20	1.21***	1.18	1.25
Region	Seoul	1.00					
	Busan	1.02	0.95	1.10			
	Daegu	1.11**	1.03	1.20			
	Incheon	0.91*	0.84	0.98			
	Gwangju	0.95	0.86	1.05			
	Daejeon	1.00	0.91	1.10			
	Ulsan	1.03	0.93	1.15			
	Gyeonggi	0.99	0.94	1.04			
	Gangwon	1.03	0.94	1.14			
	Chungbuk	0.95	0.86	1.05			
	Chungnam	0.94	0.86	1.02			
	Jeonbuk	0.97	0.88	1.06			
	Jeonnam	1.06	0.97	1.16			
	Gyeongbuk	1.20***	1.11	1.29			
	Gyeongnam	1.03	0.96	1.11			
	Jeju	0.87	0.75	1.01			

Note: 1) Results from a Multiple Logistic Regression Analysis(Forward Stepwise method, Hosmer Lemeshow test p>0.05). Statistical Significance *: p<0.05 **: p<0.01 ***: p<0.001
2) Low Birth Weight with less than 2,500 grams
Sources: Statistics Korea, Population Trend Report by Year

D. Multiple Births

Multiple births such as twins and triplets are more likely to comprehensively induce various risk factors than singletons. In particular, the risk of low birth weight or preterm birth is higher. plurality is proportional to newborn mortality. Even as they survive, a lot of burden is induced. Low birth weight among

triplets is reported to cause significantly higher mortality and disability rates than that among singletons or twins (NIH, 2011).

The number of multiples (twins or higher) out of newborns as a whole rose by 2,149 from 10,692 in 2000 to 12,841 in 2010. The number of multiples per 100 newborns increased from 1.7 in 2000 to 2.7 in 2010 (Refer to Figure 3-4).

[Figure 3-4] Multiple Births among 100 Live Births, 2000~2010
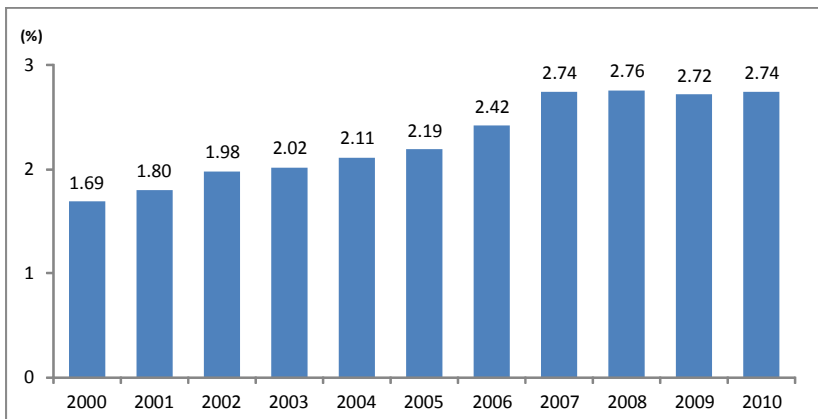
Sources: Statistics Korea, Population Trend Report by Year

Between 1999 and 2008, multiple birth rates were proportional to the maternal age in the younger than 40 age group, with the rates falling in the 40 or older age group. In the case of the level of education of mothers, unlike preterm birth or low birth weight, the university graduates or higher group produced a relatively higher number of multiples. Taking into account that multiple births are closely related to subfertility treatments, it is likely to have reflected the characteristics of treated subjects (Table 3-9).

⟨Table 3-9⟩ Plurality of Live Births, by General Characteristic, 1999~2008

(Unit: %)

Characteristics		1999			2002		
		Singleton	Twin or more	(N)[1]	Singleton	Twin or more	(N)[1]
Total		98.43	1.57	(614,233)	98.02	1.98	(494,625)
Mother's Education	Junior high or less	98.13	1.87	(30,423)	97.69	2.31	(15,492)
	High School	98.49	1.51	(370,400)	98.11	1.89	(256,107)
	College or Higher	98.37	1.63	(211,419)	97.94	2.06	(218,167)
Maternal Age(y)	<25	98.86	1.14	(87,913)	98.80	1.20	(56,527)
	25~29	98.63	1.37	(330,590)	98.36	1.64	(227,172)
	30~34	98.00	2.00	(156,003)	97.53	2.47	(170,489)
	35~39	97.43	2.57	(33,304)	97.06	2.94	(34,265)
	>39	97.99	2.01	(4,778)	97.91	2.09	(5,566)
Region	Seoul	98.45	1.55	(126,742)	97.86	2.14	(100,919)
	Busan	98.60	1.40	(40,818)	98.05	1.95	(30,472)
	Daegu	98.32	1.68	(31,054)	97.69	2.31	(24,046)
	Incheon	98.45	1.55	(33,985)	97.97	2.03	(26,488)
	Gwangju	98.30	1.70	(19,084)	97.83	2.17	(15,900)
	Daejeon	98.44	1.56	(18,526)	98.06	1.94	(15,509)
	Ulsan	98.42	1.58	(15,609)	98.10	1.90	(11,573)
	Gyeonggi	98.38	1.62	(133,018)	98.05	1.95	(115,684)
	Gangwon	98.36	1.64	(18,905)	98.13	1.87	(15,166)
	Chungbuk	98.75	1.25	(19,233)	98.09	1.91	(15,174)
	Chungnam	98.45	1.55	(23,770)	98.06	1.94	(18,847)
	Jeonbuk	98.35	1.65	(24,260)	98.32	1.68	(19,022)
	Jeonnam	98.33	1.67	(25,991)	98.12	1.88	(19,038)
	Gyeongbuk	98.31	1.69	(34,504)	98.03	1.97	(25,795)
	Gyeongnam	98.58	1.42	(40,794)	98.44	1.56	(31,960)
	Jeju	98.54	1.46	(7,940)	97.89	2.11	(6,452)

Characteristics		2005			2008		
		Singleton	Twin or more	(N)[1]	Singleton	Twin or more	(N)[1]
Total		97.81	2.19	(438,062)	97.24	2.76	(465,892)
Mother's Education	Junior high or less	98.92	1.08	(10,203)	98.14	1.86	(10,498)
	High School	97.92	2.08	(182,694)	97.35	2.65	(158,899)
	College or Higher	97.68	2.32	(240,895)	97.15	2.85	(292,457)

Characteristics		2005			2008		
		Singleton	Twin or more	(N)[1]	Singleton	Twin or more	(N)[1]
Maternal Age(y)	<25	98.74	1.26	(36,056)	98.66	1.34	(30,947)
	25~29	98.13	1.87	(175,551)	97.89	2.11	(168,893)
	30~34	97.52	2.48	(178,795)	96.84	3.16	(198,748)
	35~39	96.91	3.09	(41,031)	96.10	3.90	(59,596)
	>39	98.10	1.90	(5,651)	96.84	3.16	(6,903)
Region	Seoul	97.54	2.46	(89,484)	96.91	3.09	(94,736)
	Busan	97.91	2.09	(25,459)	97.62	2.38	(26,670)
	Daegu	97.78	2.22	(20,676)	97.12	2.88	(20,562)
	Incheon	98.18	1.82	(22,824)	97.31	2.69	(25,365)
	Gwangju	97.69	2.31	(13,228)	97.02	2.98	(13,890)
	Daejeon	97.84	2.16	(13,861)	97.02	2.98	(14,856)
	Ulsan	97.45	2.55	(10,421)	97.00	3.00	(11,365)
	Gyeonggi	97.78	2.22	(108,572)	97.24	2.76	(119,397)
	Gangwon	97.98	2.02	(12,537)	98.00	2.00	(12,373)
	Chungbuk	97.76	2.24	(13,074)	97.58	2.42	(14,064)
	Chungnam	98.02	1.98	(17,366)	97.53	2.47	(19,749)
	Jeonbuk	97.76	2.24	(15,617)	97.39	2.61	(15,878)
	Jeonnam	97.99	2.01	(15,715)	97.61	2.39	(16,363)
	Gyeongbuk	97.86	2.14	(22,196)	97.06	2.94	(23,538)
	Gyeongnam	98.24	1.76	(28,291)	97.39	2.61	(31,493)
	Jeju	97.94	2.06	(5,673)	97.69	2.31	(5,593)

Note: 1) Including cases where plurality is unknown.

Such features are similar to the 1999 ~ 2008 research on and analysis of the relative risk ratio of multiple births by mother's education, maternal age and region. In other words, regarding the 24 or younger age group as a baseline, the risk ratio of multiple birth among the 35 or older age group rose from 2.23 times in 1999 to 2.82 times in 2008. The risk ratio of multiple births among the university graduates or higher group was 2.1 times and 1.24 times higher in 2005 and 2008, respectively, than the ratio among the middle school graduates or lower group (Refer to Table 3-10).

⟨Table 3-10⟩ Odds Ratios[1] of Birth Outcome-related Factors for Multiple Births,[2] 1999~2008

Classification		1999			2002		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
Mother's Education	Junior high or less				1.00		
	High school				0.87*	0.78	0.97
	College or Higher				0.91	0.81	1.01
Maternal Age(y)	<25	1.00			1.00		
	25~29	1.21**	1.13	1.30	1.37***	1.26	1.49
	30~34	1.78***	1.66	1.92	2.06***	1.89	2.24
	>34	2.23***	2.04	2.44	2.41***	2.19	2.66
Region	Seoul	1.00			1.00		
	Busan	0.91*	0.83	1.00	0.93	0.85	1.02
	Daegu	1.10*	1.00	1.21	1.12*	1.02	1.23
	Incheon	1.02	0.92	1.12	0.99	0.90	1.09
	Gwangju	1.13*	1.01	1.28	1.06	0.95	1.19
	Daejeon	1.03	0.91	1.17	0.94*	0.83	1.06
	Ulsan	1.05	0.92	1.20	0.92	0.80	1.06
	Gyeonggi	1.06	0.99	1.12	0.94	0.89	1.00
	Gangwon	1.09	0.97	1.23	0.92	0.81	1.05
	Chungbuk	0.84*	0.74	0.97	0.97	0.85	1.09
	Chungnam	1.05	0.94	1.18	0.98	0.88	1.10
	Jeonbuk	1.11	1.00	1.24	0.85**	0.75	0.96
	Jeonnam	1.12*	1.01	1.24	0.95	0.84	1.06
	Gyeongbuk	1.14**	1.04	1.25	0.98	0.89	1.08
	Gyeongnam	0.95	0.87	1.04	0.77***	0.70	0.85
	Jeju	0.93	0.77	1.12	1.00	0.84	1.19
Classification		2005			2008		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
Mother's Education	Junior high or less	1.00			1.00		
	High school	1.94***	1.60	2.34	1.19*	1.03	1.38
	College or Higher	2.10***	1.73	2.54	1.24**	1.07	1.43
Maternal Age(y)	<25	1.00			1.00		
	25~29	1.41***	1.27	1.56	1.53***	1.37	1.70
	30~34	1.87***	1.69	2.07	2.30***	2.07	2.56
	>34	2.30***	2.06	2.57	2.82***	2.53	3.14
Region	Seoul	1.00			1.00		
	Busan	0.87**	0.79	0.96	0.78***	0.71	0.85
	Daegu	0.93	0.84	1.03	0.97	0.89	1.06
	Incheon	0.78***	0.70	0.86	0.91	0.84	1.00
	Gwangju	0.98	0.87	1.11	1.02	0.92	1.13
	Daejeon	0.91	0.81	1.03	1.01	0.91	1.11
	Ulsan	1.10	0.96	1.25	1.03	0.92	1.16
	Gyeonggi	0.93*	0.88	0.99	0.93**	0.88	0.98

Classification		2005			2008		
		OR	95.0% C.I.		OR	95.0% C.I.	
			Lower	Upper		Lower	Upper
	Gangwon	0.88*	0.77	1.00	0.70***	0.61	0.79
	Chungbuk	0.98	0.87	1.11	0.86**	0.77	0.97
	Chungnam	0.89	0.79	0.99	0.89*	0.80	0.98
	Jeonbuk	0.98	0.87	1.10	0.91	0.82	1.01
	Jeonnam	0.89	0.79	1.00	0.85**	0.77	0.95
	Gyeongbuk	0.93	0.84	1.03	1.03	0.95	1.12
	Gyeongnam	0.75***	0.68	0.83	0.91*	0.84	0.99
	Jeju	0.85	0.70	1.03	0.76**	0.64	0.91

Note: 1) Results from a Multiple Logistic Regression Analysis(Forward Stepwise method, Hosmer Lemeshow test p>0.05). Statistical Significance *: p<0.05 **: p<0.01 ***: p<0.001
2) Twin or more

Sources: Statistics Korea, Population Trend Report by Year

E. Birth Defects

Birth defects refer to health problems at birth (birth and stillbirth), regardless of causes or timing, including not only physical deformation but also paresthesia, chromosal abnormalities, metabolic disorders, and neuro-developmental abnormalities. The occurrence of birth defects is usually reported not as incidence rate but as prevalence. The reason why prevalence, rather than incidence rate, is used is related to the fact that birth defects are theoretically incurred following pregnancy but that in many cases they disappear through natural abortion in the early stages of pregnancy. Birth defects occur as each organ is developed in the fetal period. In particular, given that the formation and growth of the circulatory system in the fetal period are incurred along with other organs, birth defects in the circulatory system also tend to incur the deformation of other organs, expanding the disease-related burden.

Out of a total of newborns in Korea between 2005 and 2006, the number of infants with birth defects totaled 25,976, accounting for about 2.9% of a total of newborns. Of those, infants with birth defects in the circulatory system took up about 45.2% (about a half of the total)

The prevalence of birth defects differs by birth weight, gestational weeks, plurality, and maternal age, especially rising among low birth weight, preterm birth, and multiple birth. It is also proportional to maternal age (Refer to Table 3-11).

⟨Table 3-11⟩ Prevalence of Birth Defects among 1,000 Live Births, 2005~2006

Characteristics		Total Birth Defects	Major Birth Defects[1]	Birth Defects in Circulatory System
Total		29.4	20.1	13.3
Birth Weight	<1500g	285.6	141.9	215.8
	1500~2499g	79.0	57.2	49.0
	>2499g	24.5	16.9	10.2
Gestational Weeks	<37 weeks	90.5	60.0	59.0
	≥37 weeks	24.2	16.7	10.1
Plurality	Singleton	27.0	18.6	12.2
	Twin or more	50.1	32.9	29.5
Maternal Age(y)	<25	23.1	16.3	10.0
	25~29	28.0	19.0	12.3
	30~34	28.3	19.2	12.8
	35~39	29.9	20.8	14.4
	>39	35.4	24.8	17.6
Region	Seoul	30.5	20.0	12.4
	Busan	32.1	23.2	17.5
	Daegu	35.7	25.7	19.2
	Incheon	23.1	16.0	10.6
	Gwangju	23.3	14.7	10.1
	Daejeon	31.6	22.9	15.9
	Ulsan	28.9	19.1	12.8
	Gyeonggi	25.9	17.6	11.0
	Gangwon	25.9	17.3	11.6
	Chungbuk	23.7	16.5	10.1
	Chungnam	25.8	17.6	12.3

Characteristics	Total Birth Defects	Major Birth Defects[1]	Birth Defects in Circulatory System
Jeonbuk	23.5	17.6	9.5
Jeonnam	23.5	15.8	9.3
Gyeongbuk	32.0	22.0	15.4
Gyeongnam	30.4	22.0	16.7
Jeju	19.9	14.3	9.8

Note: 1) Sixty-nine birth defects by ICBDSR, EU, NBDPN (Refer to Table 3-12)
Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

〈Table 3-12〉 List of Major Birth Defects

Classification		Birth Defect	(ICD-10)	EU[1]	ICB[2]	NB[3]
Central Nervous System	1	Anencephaly	Q00.0-Q00.2	●	●	○
	2	Spina bifida	Q05.0-Q05.9	●	●	●
	3	Encephalocele	Q01.0-Q01.9	●	●	●
	4	Microcephaly	Q02	●	●	●
	5	Arhinencephaly/Holoprosencephaly	Q04.0-Q04.2	●	○	
	6	Congenital Hydrocephalus	Q03.0-Q03.9	●	●	●
Eyes, Ears, Face	7	Anophthalmos	Q11.0~Q11.1	●	●	●
	8	Microphthalmos	Q11.2	●		●
	9	Congenital cataract	Q12.0	●		●
	10	Aniridia	Q13.1			●
	11	Congenital glaucoma	Q15.0			●
	12	Anotia	Q16.0		●	●
	13	Microtia	Q17.2		●	●
	14	Cleft palate without cleft lip	Q35.1-Q35.9	●	●	●
	15	Cleft lip with or without cleft palate	Q36.0-Q36.9, Q37.0-Q37.9	●	●	●
	16	Choanal Atresia	Q30.0	●	●	
Cardiovascular System	17	Common truncus	Q20.0	●		●
	18	Transposition of great arteries(TGA))	Q20.3	●	●	●
	19	Single ventricle	Q20.4	●		
	20	Tetralogy of Fallot	Q21.3	●	●	●
	21	Ventricular septal defect(VSD)	Q21.0	●		●
	22	Atrial septal defect	Q21.1	●		●
	23	Pulmonary valve atresia and stenosis	Q22.0, Q22.1	●		●
	24	Tricuspid valve atresia and stenosis	Q22.4	●		●
	25	Ebstein's anomaly	Q22.5	●		●

Classification		Birth Defect	(ICD-10)	EU[1]	ICB[2]	NB[3]
	26	Hypoplastic left heart syndrome	Q23.4	●	●	●
	27	Patent ductus arteriosus	Q25.04)			●
	28	Coarctation of aorta	Q25.1	●	●	●
	29	Aortic valve atresia/stenosis	Q23.0	●		●
	30	Total anomalous pulmonary venous return	Q26.2	●		
Gastrointestinal System	31	Oesophageal atresia/stenosis with or without fistula	Q39.0, Q39.1	●	○	●
	32	Anorectal atresia/stenosis	Q42.0-Q42.3	●	●	●
	33	Small intestine atresia/stenosis	Q41.0-Q41.9		●	
	34	Duodenal atresia or stenosis	Q41.0	●		
	35	Small intestine atresia/stenosis	Q41.1-Q41.9	●		
	36	Hirshsprung's disease(congenital megacolon)	Q43.1	●		●
	37	Atresia of bile duct	Q44.2	●		●
	38	Annular pancreas	Q45.1	●		
Urology Reproductive Organs	39	Renal agenesis	Q60.0-Q60.6	○	●	●
	40	Hypospadias	Q54.0-Q54.9	●	●	●
	41	Epispadias	Q64.0	●	●	●
	42	Bladder exstrophy	Q64.1	●	●	●
	43	Renal dysplasia	Q61.4	●		
	44	Cystic kidney	Q61.0-61.9		●	
	45	Indeterminate sex	Q56.0-Q56.4	●	●	
	46	Undescended testis	Q53.0-Q53.95)		●	
	47	Obstructive genitourinary defect	Q62.0-Q62.8, Q64.3			●
	48	Congenital hydronephrosis	Q62.0	●		
Musculoskeletal System	49	Reduction deformity, upper limbs	Q71.0-Q71.9	●		●
	50	Reduction deformity, lower limbs	Q72.0-Q72.9	●		●
	51	Total Limb reduction defects(include unspecified	Q71.0-Q71.9,72.0-Q72.9, 73.0-Q73.8		●	
	52	Congenital hip dislocation	Q65.0-Q65.9	○		●
	53	Club foot - talipes equinovarus	Q66.0	●		
	54	Diaphragmatic hernia	Q79.0	●	●	●
	55	Polydactyly	Q69.0-Q69.9	●	●	
	56	Syndactyly	Q70.0-Q70.9	●		
	57	Arthrogrypposis multiplex congenital	Q74.3	●		
	58	Craniosynostosis	Q75.0	●		
	59	Jeunes syndrome	Q77.2	●		
	60	Achondroplasia/Hypochondroplasia	Q77.4	●		
	61	Omphalocele	Q79.2	●	●	●
	62	Gastroschisis	Q79.3	●	●	●
Chromosol Abnormality, Genetic Syndrome	63	Trisomy 13	Q91.4-Q91.7	●	●	●
	64	Trisomy 18	Q91.0-Q91.3	●	●	●
	65	Down's Syndrome	Q90.0-Q90.9	●	●	●
	66	Turner's syndrome	Q96.0-Q96.9	●		

Classification		Birth Defect	(ICD-10)	EU[1]	ICB[2]	NB[3]
	67	Kleinfelter's syndrome	Q98.0-Q98.4	●		
	68	Wolff-Hirschorn syndrome	Q93.3	●		
	69	Cri-du-chat syndrome	Q93.4	●		

Note: 1) EUROCAT
2) ICBDSR
3) NBDPN
4) Birth weight with more than 2499g
5) Gestational age with more than 36 weeks
● Identical Disease Codes ○ Partial differences in disease code

▨ Managed by Korea's Maternal and Child Care Project ▨ Statistical data should be submitted (OECD 2006)

Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

The prevalence of birth defects is relatively high among low birth weight infants and especially high among very low birth weight infants weighing less than 1,500g (Refer to Figure 3-5).
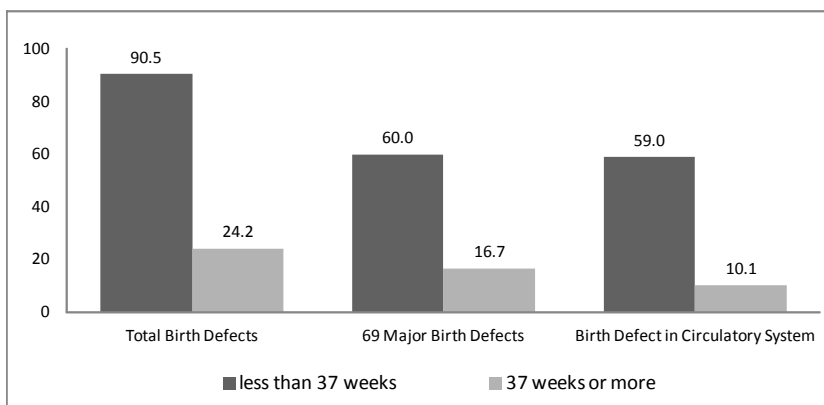
[Figure 3-5] Prevalence of Birth Defects among 1,000 Live Births, by Birth Weight, 2005~2006
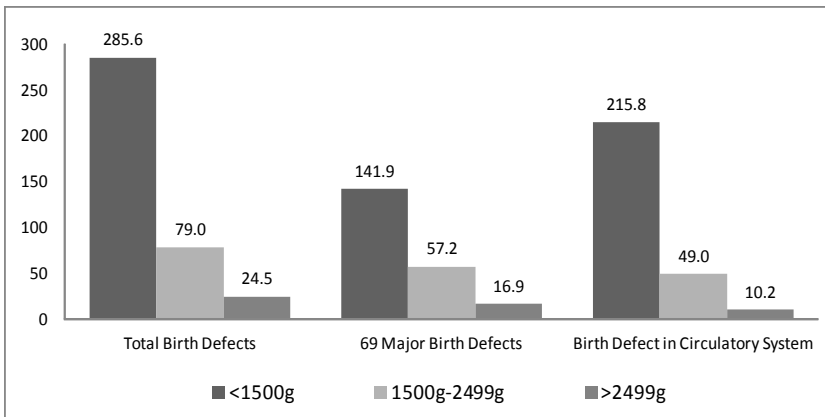
Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

As in the case of low birth weight infants, preterm babies with a gestational age of less than 37 weeks significantly differ from normal infants with a gestational age of 37 weeks or longer in birth defects in the circulatory system, rather than in birth defects as a whole. In the case of birth defects as a whole, the birth defect prevalence of preterm infants with a gestational age of less than 37 weeks is estimated at 904.5 among 10,000 newborns, 3.7 times higher than that of newborns with a gestational age of 37 weeks or longer. On the other hand, the circulatory defect prevalence of preterm infants with a gestational age of less than 37 weeks is about 589.5 among 10,000 newborns, 5.8 times higher than that of newborns with a gestational age of 37 weeks or longer (Refer to Figure 3-6).
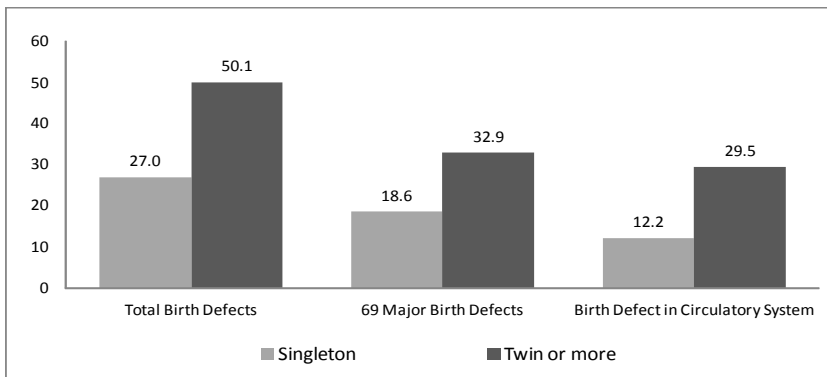
〔Figure 3-6〕 Prevalence of Birth Defects among 1,000 Live Births, by Gestational Weeks, 2005~2006

Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

Furthermore, as in the case of preterm birth or low birth weight, the birth defect prevalence of multiples is 1.9 times higher than that of singletons, with the prevalence of circulatory defects of multiples being 2.4 times higher than that of singletons. The difference in the prevalence between multiples and singletons is higher in circulatory defects, rather than in birth defects as a whole (Refer to Figure 3-7).

〔Figure 3-7〕 Prevalence of Birth Defects among 1,000 Live Births, by plurality, 2005~2006

Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

The birth defect prevalence by maternal age was estimated at 231 (the lowest level) among 10,000 newborns in the 24 or younger age group, with differences in prevalence between the 30 ~ 34 age group and 25 ~ 34 not being significant. However, the prevalence in the former age group was a little higher than that in the latter age group. Furthermore, in the 40 or older age group, the prevalence rose relatively significantly, being 1.5 times

higher than that of the 24 or younger age group. By maternal age, the prevalence in circulatory defects was similar to that in birth defects as a whole. The prevalence in the 40 or older age group was 1.8 times higher than that in the 24 or younger age group, which is slightly higher than the difference in the prevalence in birth defects as a whole therebetween (Refer to Figure 3-8).

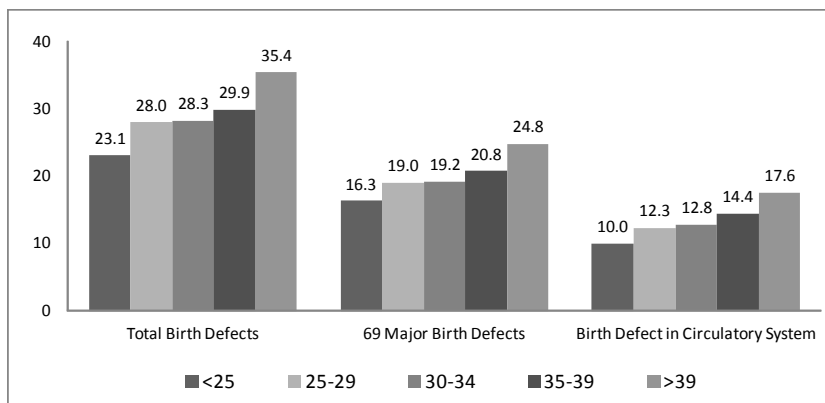〔Figure 3-8〕 Prevalence of Birth Defects among 1,000 Live Births, by Age of Mother, 2005~2006

Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health
and Welfare, KIHASA

The differences in the birth defect prevalence by maternal age surfaced consistently among singletons regardless of birth weight. Among multiples, especially low birth weight infants, the prevalence fell even in the 35 or older age group. Considering that multiples in late childbearing are related to subfertility treatments, it is presumed to be closely connected with pre-delivery management. Therefore, it is indirectly confirmed that maternal

ages are proportional to the risk of infants with birth defects (Refer to Table 3-13, Figure 3-9).

〈Table 3-13〉 Prevalence of Birth Defects among 1,000 Live Births, by Plurality, Birth Weight, and Maternal Age, 2005~2006

Birth Weight	Maternal Age(y)	Singleton		Twin or more	
		Total Birth Defects	Birth Defects in Circulatory System[1]	Total Birth Defects	Birth Defects in Circulatory System[1]
<1,500g	<25	201.1	150.8	176.5	137.3
	25~29	266.7	211.9	241.9	169.7
	30~34	307.6	233.1	274.9	194.3
	35 or older	341.7	250.0	181.8	151.5
	35~39	335.9	244.1	194.9	161.0
	>39	375.0	284.1	71.4	71.4
	Total	295.2	224.5	244.1	176.3
1,500g~2,499g	<25	60.6	35.6	42.5	30.7
	25~29	79.7	49.0	40.2	25.0
	30~34	90.6	56.8	52.9	32.2
	35 or Older	93.9	61.2	60.2	36.3
	35~39	91.2	60.4	59.7	36.1
	>39	108.6	65.8	66.7	38.1
	Total	84.4	52.7	49.2	30.3
<2,500g	<25	71.2	44.3	56.8	42.1
	25~29	95.2	62.5	57.0	37.1
	30~34	113.0	75.1	73.0	46.9
	35 or older	127.0	86.5	70.9	46.4
	35~39	124.2	85.2	71.2	46.7
	>39	142.2	93.4	67.2	42.0
	Total	105.2	69.7	66.5	43.2
>2,499g	<25	16.2	6.4	27.3	8.4
	25~29	21.3	8.7	27.0	12.7
	30~34	25.3	10.5	30.3	14.4
	35 or older	28.9	12.7	34.4	14.3
	35~39	28.6	12.5	32.4	13.8
	>39	31.1	14.4	65.9	22.0
	Total	23.4	9.7	29.7	13.6

Note: 1) ICD-10 Q20-Q28
Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

[Figure 3-9] Prevalence of Birth Defects among 1,000 Live Births, by Plurality, Birth Weight, and Maternal Age, 2005~2006
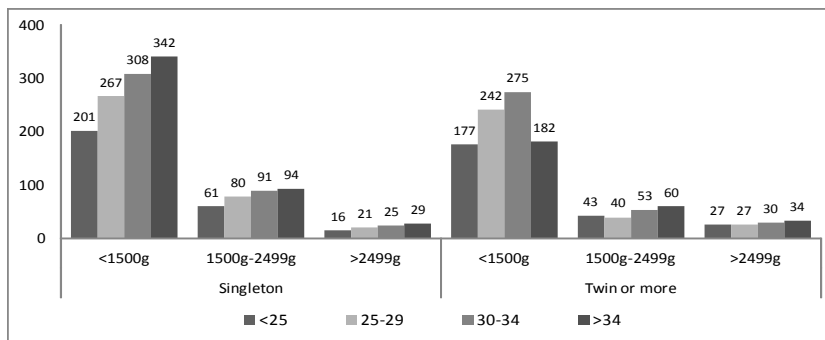
Sources: Jeong-soo Choi et al.(2009). Birth Defect Prevalence Survey. Ministry of Health and Welfare, KIHASA

F. Neonatal Mortality

A neonatal death refers to the one incurred within four weeks (28 days) after birth. It can also be classified into an early neonatal death and a later neonatal death. The former means a death within seven days after birth, the latter refers to a death between seven days and 28 days after birth.

The neonatal mortality in Korea has annually fallen to 2.0 per 1,000 newborns in 2008, ranking 8th among 34 OECD nations (Refer to Table 3-14, 3-15).

⟨Table 3-14⟩ Neonatal Deaths among 1000 Live Births,[1] 1993~2008

Classification	1993	1996	1999	2002	2005	2006	2007	2008
Male	7.0	4.4	4.1	3.5	3.0	2.7	2.2	2.0
Female	6.1	3.8	3.4	3.1	2.7	2.2	1.9	1.8
Total	6.6	4.1	3.8	3.3	2.8	2.5	2.1	2.0

Note: 1) Excluding cases where sex is unknown
Source: Infant and Maternal Death Survey, Each year, Ministry of Health and Welfare, KIHASA

〈Table 3-15〉 Neonatal Mortality Rate[1] in OECD Countries, 1960~2008

Nation	1960	1970	1980	1985	1990	1993	1996	1999	2002	2005	2006	2007	2008
Australia	14.6	12.9	7.1	6.2	4.9	3.9	3.8	3.8	3.4	3.6	3.2	3.0	2.9
Austria	24.6	19.1	9.4	7.1	4.4	3.7	3.4	2.8	2.8	3.0	2.6	2.5	2.5 [4]
Belgium	20.4	14.2	7.5	5.8	4.2	-	2.8	3.1	2.1	2.3	-	2.5	2.5 [4]
Canada	17.6	13.5	6.7	5.2	4.6	4.2	3.9	3.6	3.9	4.1	3.7	3.8	3.8 [4]
Chile	-	31.7	16.7	9.9	8.5	6.9	6.3	5.9	5.0	5.2	5.1	5.6	5.5
Czech Republic	13.1	15.1	11.3	8.6	7.7	4.8	3.8	2.9	2.7	2.0	2.3	2.1	2.1 [4]
Denmark	16.1	11.0	5.6	4.7	4.6	3.5	3.9	-	3.4	3.3	3.2	3.0	3.0 [4]
Estonia	-	-	-	-	8.0	10.1	6.9	6.0	3.6	-	2.7	2.9	2.9 [4]
Finland	14.4	10.5	5.1	4.3	3.7	3.0	2.9	2.6	2.2	2.1	2.0	1.9	1.9 [4]
France	17.7	12.7	5.8	4.6	3.6	3.1	3.1	2.8	2.7	2.5	2.5	2.5	2.5 [3]
Germany	23.2	17.2	8.1	5.3	3.7	3.1	3.0	2.9	-	2.5	2.6	2.7	2.7 [4]
Greece	19.5	19.6	13.9	10.5	6.5	6.1	5.2	4.4	3.5	2.6	2.5	2.3	1.1
Hungary	27.0	28.4	17.8	15.6	10.8	8.6	7.3	5.6	5.2	4.1	3.7	3.9	3.8
Iceland	9.2	10.3	6.0	3.6	4.0	2.8	3.0	1.5	1.3	1.6	0.9	1.3	1.4
Ireland	20.4	12.8	6.7	5.3	4.8	4.0	4.1	4.0	3.5	2.9	2.6	2.1	2.1 [4]
Israel	-	-	9.8	7.9	6.4	4.7	4.1	3.7	3.6	2.7	2.4	2.4	2.3
Italy	23.6	20.2	11.3	8.2	6.3	5.3	4.6	3.7	3.2	2.8	2.7	2.7	2.7 [3]
Japan	17.0	8.7	4.9	3.4	2.6	2.3	2.0	1.8	1.7	1.4	1.3	1.3	1.2
Korea	-	-	-	-	-	6.6	4.1	3.8	3.3	2.8	2.5	2.1	2.0
Luxembourg	19.1	16.8	5.3	2.9	4.3	3.4	2.8	3.2	3.6	1.5	1.5	1.3	1.3 [4]
Mexico	-	28.1	21.0	17.3	18.8	16.9	14.9	12.0	11.1	10.7	10.2	9.7	9.6
Netherlands	13.5	9.5	5.7	5.0	4.8	4.5	4.2	4.0	3.8	3.7	3.3	3.2	3.2 [4]
New Zealand	-	-	6.0	4.7	4.2	3.8	3.9	3.2	4.1	3.1	2.7	2.5	2.9
Norway	11.7	9.5	5.1	4.7	3.9	3.5	2.5	2.7	2.5	2.1	2.0	1.8	1.8 [4]
Poland	-	19.5	13.3	13.0	11.5	9.6	8.9	6.3	5.3	4.5	4.3	4.3	3.9
Portugal	27.9	24.3	15.5	12.2	7.0	5.6	4.2	3.6	3.4	2.2	2.1	2.1	2.1 [4]
Slovak Republic	14.1	16.7	13.9	11.1	8.4	7.5	6.9	5.1	4.7	4.1	3.5	3.4	3.4
Slovenia	20.4	16.0	10.8	8.6	5.1	4.6	3.2	3.2	3.1	3.0	2.5	2.0	2.0 [4]
Spain	20.2	17.5	8.5	5.9	5.0	4.1	3.5	2.8	2.8	2.4	2.4	2.4	2.4 [2]
Sweden	13.4	9.1	5.0	4.2	3.5	3.1	2.5	2.2	2.2	1.5	1.8	1.7	1.7
Switzerland	16.1	10.9	5.9	4.5	3.8	3.5	3.2	3.4	3.6	3.2	3.4	3.1	3.2
Turkey	-	-	-	-	-	-	-	-	-	-	14.3	13.9	13.0
United Kingdom	16.0	12.5	7.7	5.4	4.5	4.2	4.1	3.9	3.5	3.5	3.5	3.3	3.2
United States	18.7	15.1	8.5	7.0	5.9	5.3	4.8	4.7	4.7	4.5	4.5	4.5	4.5 [3]
Average	18.1	16.0	9.2	7.2	5.9	5.2	4.5	3.9	3.6	3.2	3.3	3.2	3.2
(Number of Nations)	(26)	(29)	(31)	(31)	(32)	(32)	(33)	(32)	(32)	(32)	(33)	(34)	(34)

Note: 1) Neonatal deaths among 1,000 Live Births. 2) 2005 data. 3) 2006 data 4) 2007 data
Sources: OECD(2011). OECD Health Data 2010.

However, the neonatal mortality in Korea has recently lost its downward momentum. The high risk of neonatal deaths among multiples and in late childbearing makes the future prospect very gloomy amid a rise in maternal age and the number of subfertility treatments (Refer to Table 3-16).

〈Table 3-16〉 Neonatal Deaths among 1000 Live Births, by Plurality and Maternal Age[1], 1999~2007

Plurality	Maternal Age(y)	1999	2002	2005	2006	2007
Singleton	<25	20.1	16.9	18.0	14.5	15.2
	25~29	17.2	14.5	10.3	11.3	12.0
	30~34	29.5	22.5	16.7	16.1	15.5
	>34	51.0	46.6	39.7	32.6	30.1
	Total[2]	22.8	20.1	16.6	16.1	16.0
Twin or more	<25	174.5	353.0	280.6	71.1	216.0
	25~29	213.0	141.9	168.7	150.9	109.9
	30~34	186.6	188.3	130.9	109.7	111.1
	>34	281.1	295.1	157.3	189.0	155.8
	Total[2]	207.2	193.9	154.5	133.0	122.6
Total	<25	31.9	29.1	29.2	19.7	18.9
	25~29	29.8	23.4	19.2	18.6	15.3
	30~34	48.6	37.5	28.4	24.6	20.7
	>34	78.8	75.4	61.4	48.1	38.7
	Total[3]	38.0	33.1	28.3	24.7	20.9

Note: 1) Weighted cases where the maternal age is unknown while considering the age distribution.
2) Including cases where maternal ages are unknown.
3) Including cases where maternal ages and plurality are unknown.
Sources: Infant and Maternal Death Survey, Each year, Ministry of Health and Welfare, KIHASA

In relation thereto, the mortality of newborns with a low birth weight is higher in singletons than in multiples. In the case of singletons, the neonatal mortality in the 25 or older (maternal age) age group has recently shown a rising trend (Refer to Table 3-17).

⟨Table 3-17⟩ Infant Deaths among 10,000 Live Births with LBW[1], by Plurality and Maternal Age, 1999~2007

(Unit: Persons)

Plurality	Maternal Age(y)	1999	2002	2005	2006	2007
Singleton	<25	409.0	276.3	262.0	243.9	226.2
	25~29	392.5	275.2	168.5	206.9	215.7
	30~34	579.7	429.7	255.1	289.3	305.7
	>34	674.7	636.9	422.2	420.1	430.1
	Total[2]	560.4	426.4	320.6	337.0	315.2
Twin or more	<25	248.1	570.7	409.1	117.6	312.5
	25~29	365.8	247.5	245.7	237.1	180.7
	30~34	337.1	328.3	185.6	186.6	188.1
	>34	486.3	528.2	236.0	312.5	263.2
	Total[2]	414.3	370.1	279.9	269.0	222.9
Total	<25	384.7	327.6	284.9	235.3	237.9
	25~29	386.9	268.4	187.9	217.2	205.5
	30~34	523.2	399.3	237.8	261.1	263.6
	>34	635.9	601.3	377.9	391.1	373.1
	Total[3]	530.6	417.6	314.8	327.8	290.3

Note: 1) Low Birth Weight with less than 2,500 grams
2) Including cases where maternal ages are unknown.
3) Including cases where maternal ages and plurality are unknown.
Sources: Infant and Maternal Death Survey, Each year, Ministry of Health and Welfare, KIHASA

Perception of Pregnant Women of Adverse Birth Outcomes

Chapter 4

Perception of Pregnant Women of Adverse Birth Outcomes[1]

A. Perception of Relationship between Maternal Age and Birth Outcomes

"Do you know that there is a relationship between maternal age and birth outcomes?" "If yes, which maternal age is exposed to the adverse birth outcomes such as preterm births and low birth weight babies?" Through the above questions, the recognition of the relationship between maternal age by general characteristics of pregnant women and neonatal health was identified. About 86.4% of respondents were aware of the relationship between maternal age and birth outcomes, while 4.9% thereof responded that there was no relationship between the two. Such low awareness was similarly witnessed in all groups including the 35 or older age group, regardless of general characteristics or childbirth-related features.

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1) Out of the top 10 medical institutions in the number of childbirths(2010) across the nation, one general hospital and one clinic were chosen to conduct a survey of about 600 pregnant women. The survey included age at marriage, the timing of the first pregnancy/childbirth, experiences in high-risk pregnancy/childbirth (childbirth-related behaviors), the knowledge of the occurrence/prognosis of high-risk newborns such as preterm births, low birth weight infants, related information sources, personal worries regarding high-risk pregnancy/high-risk newborns, and hazardous behaviors during pregnancy.

Furthermore, even in the case of recognizing the relationship therebetween, only 73.3% of respondents regarded the age of 35 or over as critical(Refer to Table 4-1).

〈Table 4-1〉 Perception of Relationship between Maternal Age and Birth Outcomes, by General Characteristics

(Unit: %)

Characteristics		Relationship			If yes, risk ages? (multiple responses)					
		Yes	No	Do not know	<20	20~24	25~29	30~34	35~39	>39
Total		86.4	4.9	8.7	17.1	1.8	1.8	8.4	73.3	88.2
(N)		(510)	(29)	(52)	(87)	(9)	(9)	(44)	(380)	(450)
Age	<25	82.4	5.9	11.8	7.1	-	-	35.7	78.6	92.9
	25~29	87.4	2.9	9.8	19.1	2.0	3.9	13.8	75.0	83.6
	30~34	86.3	5.8	7.9	15.8	1.7	0.8	4.2	74.2	88.3
	>34	85.8	5.8	8.3	18.4	1.9	1.0	6.8	68.0	94.2
Age at first birth	<25	80.0	10.0	10.0	18.8	-	6.3	25.0	68.8	87.5
	25~29	84.2	6.5	9.2	17.4	3.2	3.2	10.3	72.9	83.9
	30~34	83.0	6.5	10.5	15.0	2.4	1.6	4.7	72.4	85.8
	>34	90.6	-	9.4	20.7	-	-	10.3	65.5	96.6
	No delivery	91.4	2.0	6.6	17.7	0.6	0.6	7.7	76.2	92.3
Education	High School	82.9	6.8	10.3	14.0	3.3	2.5	15.7	75.2	77.7
	University	89.0	4.0	7.0	17.2	0.9	1.2	6.6	74.9	90.9
	Graduate Sch or higher	86.2	3.4	10.3	24.0	2.0	2.0	4.0	62.0	96.0
Employment	Employed	89.3	4.3	6.4	15.9	1.6	1.6	7.1	74.4	90.0
	Unemployed	83.9	5.5	10.6	20.3	1.6	1.6	9.3	73.1	87.9

B. Concern for Adverse Birth Outcomes

"What are you especially worrying about in relation to your pregnancy and delivery?" "What are your specific worries?" According to the survey based on the above questions, about 60.8% of the total subjects worried about risky circumstances

in relation to pregnancy and delivery. In particular, for those without experiences in delivery, the figure rose to 65.7%, the highest level compared to the other groups. By age, 57.1% of those aged 24 or younger most worried about preterm birth and toxemia. 45.3% of those aged 35 or older most worried about congenital malformation. Those with a high level of education (graduate school graduates or higher) and the employed were more worried about stillbirth, natural abortion and toxemia than the unemployed and university graduates or lower (Refer to Table 4-2).

〈Table 4-2〉 Concern for Adverse Birth Outcomes, by General Characteristics

(Unit: %)

Characteristics		Concern		If yes, specific worries? (multiple responses)								
		Yes	No	Stillbirth	Spont.l Abortion	Ectopic Pregnancy	Toxe mia	Caesa rean	Preterm Birth	Low Birth Weight	Birth Defects	Mother's Health
Total		60.8	39.2	7.5	24.9	5.0	33.5	35.5	37.7	20.4	42.2	4.2
(N)		(358)	(231)	(27)	(89)	(18)	(120)	(127)	(135)	(73)	(151)	(15)
Age	<25	41.2	58.8	-	14.3	-	57.1	28.6	57.1	28.6	14.3	-
	25~29	56.9	43.1	4.0	22.2	1.0	30.3	44.4	36.4	25.3	44.4	4.0
	30~34	63.7	36.3	9.6	27.1	6.8	32.2	32.8	36.7	18.1	40.7	4.0
	>34	62.5	37.5	8.0	24.0	6.7	38.7	30.7	40.0	18.7	45.3	5.3
Age at first birth	<25	55.0	45.0	-	18.2	-	36.4	27.3	54.5	27.3	36.4	-
	25~29	54.9	45.1	2.0	24.8	3.0	32.7	33.7	30.7	17.8	43.6	4.0
	30~34	61.4	38.6	10.6	33.0	9.6	33.0	28.7	36.2	22.3	53.2	3.2
	>34	62.5	37.5	5.0	15.0	-	30.0	40.0	45.0	20.0	35.0	10.0
	No delivery	65.7	34.3	10.8	20.8	4.6	34.6	41.5	42.3	20.8	34.6	4.6
Education	High School	61.6	38.4	4.4	23.3	3.3	36.7	35.6	34.4	15.6	35.6	5.6
	University	59.7	40.3	6.8	21.6	5.0	32.4	35.6	39.6	22.1	46.8	4.1
	Graduate Sch or higher	63.8	36.2	18.9	37.8	10.8	32.4	40.5	37.8	21.6	29.7	2.7
Employment	Employed	62.7	37.3	8.3	26.3	6.5	32.7	35.9	38.2	20.7	42.9	3.7
	Unemployed	59.0	41.0	7.0	22.7	3.1	35.2	35.9	37.5	21.1	42.2	4.7

C. Attitude towards Late Childbearing in relation to Adverse Birth Outcomes

"If the risk of delivering unhealthy babies such as preterm birth or low birth weight is high at your age, what do you think about your pregnancy?" In relation to the question, only 6.8% of the respondents answered that they would never conceive. 3.5% thereof replied that they would start a baby, taking the risk. Generally speaking, 58.5% of the total subjects showed their intention to get pregnant at a risky age. About 68% of those aged 35 or over revealed such an attitude. Taking into account that the highest percentage of those aged 25~29 replied that they would not have a baby at a risky age, it is believed that the attitude towards risky ages has some effects on determining real maternal ages (Refer to Table 4-3).

⟨Table 4-3⟩ Intention of Childbirth at Ages with High Risk of Adverse Birth Outcomes

(Unit: %)

Classification		Never do	Try to avoid	Depend on Situations	Certainly do	Do not know	Total (N)	
	Total	6.8	34.7	52.9	3.5	2.1	100.0	(516)
Age	<25	7.1	28.6	64.3	-	-	100.0	(14)
	25~29	6.0	41.1	47.0	4.0	2.0	100.0	(151)
	30~34	7.3	35.1	52.4	2.4	2.8	100.0	(248)
	>34	6.8	25.2	61.2	5.8	1.0	100.0	(103)
Age at first birth	<25	6.3	31.3	62.5	-	-	100.0	(16)
	25~29	11.7	43.5	39.0	3.2	2.6	100.0	(154)
	30~34	6.8	30.1	57.1	3.0	3.0	100.0	(133)
	>34	-	27.6	62.1	6.9	3.4	100.0	(29)
	No delivery	3.8	31.7	59.6	3.8	1.1	100.0	(183)
Education	High School	6.5	34.1	54.5	2.4	2.4	100.0	(123)
	University	6.0	35.0	53.9	3.0	2.1	100.0	(334)
	Graduate Sch. or higher	11.8	31.4	49.0	5.9	2.0	100.0	(51)
Employment	Employed	6.4	36.0	51.3	4.5	1.9	100.0	(314)
	Unemployed	6.5	32.6	56.0	2.2	2.7	100.0	(184)

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Conclusion and Policy Implication

Chapter 5
Conclusion and Policy Implication

A. Conclusion

As women's advancement in society has expanded through employment, etc., pregnancy and delivery(women's own functions) that cause restrictions to social life to a certain degree have been affected by social system, cultures, and circumstances, displaying related behaviors in various forms.

Considering that extramarital deliveries are uncommon in Korea, a rise in marriage age leads to an increase in maternal age. On the other hand, the number of infants with a high risk of preterm birth or low birth weight causing deaths or disabilities has also gone up.

Reviewing theories and substantial data regarding the relationship between birth-related behaviors (late childbearing, etc.) and birth oucomes, the high risk pregnancies of women aged 35 or older are expected to further expand, thereby increasing the adverse birth outcomes.

1) Increase of high risk Pregnancy

In particular, high-risk pregnancies are reported to be closely related to age at first birth. In Korea, the age at first birth reached 30.1 on average in 2010, with the 35 or older age group accounting

for 11.1% of the total. The average age at first birth or the percentage of the 35 or older segment has consistently grown over the past 20 years. The reason why maternal ages have continuously risen is that in the circumstances where births based on legal marriage are common, people in the Korean society tend to delay marriage or delivery. Such a trend is expected to continue for the time being, with late childbearing (35 or older) reaching 20~25% as in the case of advanced nations such as Japan or Australia. The background can be summarized as below.

○ Trends in Age at Marriage and Related Attitudes

Women's age at first marriage had annually risen from 24.8 in 1990 to 28.9 in 2010 for about two decades. Such a trend was indirectly confirmed through research on the recognition of unmarried women of ideal marriage age. According to nationwide research on trends in marriage and delivery, the ideal marriage age of unmarried women rose by 0.5 on average between 2005 and 2009, with the maximum value of ideal marriage age exceeding 35 for unmarried women in all age groups. Five to eight percent of unmarried women aged 35 or older responded that their ideal marriage age was 35 or over, signaling that the number of those aged 35 or older at first marriage will rise. Furthermore, comparing ideal marriage ages to desired ages at marriage, a major portion of those whose ideal age is between 20 and 29 said that their desired age of marriage was 30+. Such a trend deepened between 2005 and 2009. The ideal marriage

age was higher in women employed or looking for a job than in those not employed or not looking for a job. As a result, under the circumstances where the social participation of women is expected to further expand, the age at marriage is likely to go up.

○ Attitude Regarding Late Childbearing

In relation to the desired delivery following marriage by the desired age of marriage for unmarried women, 92.3% of those aged 35 or over in 2009 wanted to have a baby certainly or if possible, up from 87.5% in 2005. Furthermore, in terms of the first delivery timing following marriage, the percentage of cases where priorities are given to economic stability such as stable employment rose between 2005 and 2009. On the other hand, the percentage of cases where the optimal childbearing age is considered fell between 2005 and 2009. As a result, the period between marriage and first delivery climbed to 1.8 years in 2010, up 1.6 months from the year 2000. Furthermore, according to the research on married women, the percentage of 'being employed', a reason for the first artificial abortion, also grew between 2000 and 2009, regardless of age.

On the other hand, the attitude towards delivery timing that is commonly witnessed both among unmarried and married women makes us suspect that they may lack the understanding of high-risk pregnancy. The results were confirmed again through the research on women during pregnancy or in a lying-in period. Namely, the percentage of those who recognize the relationship between birth age and the health of newborns was estimated at 86.4%.

13.6% of the respondents replied that there is no relationship therebetween or that they have no idea of the issue. Even in the case where relationship therebetween is recognized, only 73.3% thereof regarded 35 or over as a risky age. Furthermore, only 62.5% of pregnant women aged 35 or older worried about the risk of mothers or fetuses in relation to their pregnancy. With respect to delivery at the age highly exposed to the occurrence of high risk newborns, 52.9% of pregnant women surveyed showed their willingness to give birth, considering circumstances and 3.5% thereof responded that they would bear a child regardless of risk.

Comprehensively speaking, a rising desired age of marriage, the willingness of women marrying late in life to give birth, and employment-related delivery delay have raised the possibility of late pregnancies. In addition, married and unmarried women have yet to fully recognize the status of high-risk pregnancy or the health of newborns before marriage and delivery, with the result that such a trend is not likely to change in the future without fundamental improvement in recognition thereof.

2) Increase of Adverse Birth Outcomes

The neonatal period between birth and 28 days (4 weeks) thereafter is highly exposed to deaths and disabilities. In particular, high-risk newborns related to preterm birth, low birth weight, and birth defects show high reliance on intensive care services including emergency aid. As a result, diseases, disabilities and deaths are regarded as representative health indicators that

determine the level of national health care. The diseases, disabilities and deaths of newborns are related to the quality and quantity of the population, with the importance thereof being more acknowledged.

The health risk of newborns is reported to have sharply risen among pregnant women aged 35 or older, which was again confirmed by this research. As mentioned earlier, rising high-risk pregnancies are expected to inevitably lead to an increase in the number of high-risk newborns. Under the government's support for subfertility treatments, the number of pregnancies through artificial or external fertilization with a high risk of multiple birth has climbed. The number of high-risk newborns related to preterm birth or low birth weight has also gone up regardless of maternal age, signaling that the overall reproductive health level of fertile women has worsened. As a result, the health risk of newborns in Korea is forecast to continuously rise, amid changes in birth-related behaviors.

B. Policy Implication

The enhancement in the level of education of women and resulting expansion in their social advancement is one of the phenomena that incidentally occur in the process of national development. Against this backdrop, women may minimize pregnancies or deliveries in terms of quantity and delay them to the fullest possible extent, given that they can cause a variety of physical and mental burdens as well as restrictions to social

life. In particular, as in the case of Korea, if marriages should be prepared in advance and social support and care are not sufficient in terms of pregnancy, delivery and child rearing, the aforementioned trend is expected to be more witnessed. Such a phenomenon is also confirmed through rapidly falling prolificacy and rising late childbearing.

In relation to low fertility rates and late childbearing, which have been accepted as a fact, advanced nations that experienced such circumstances earlier have devised diverse counter-measures. In relation to late childbearing that can cause undesirable results in the health of mothers and newborns, relatively concerted efforts have been made. In other words, separately establishing and operating a health service delivery system before and after birth by region, high-risk pregnant women can be more thoroughly managed through information sharing and the distribution of standard treatment guidelines. A special attention should also be paid to lowering neonatal mortality rate. Along with such an initiative, national efforts have been made to track and monitor threats in the health of high-risk pregnant women and newborns, selecting and managing indicators in mother and neonatal health as national objectives. Such a scheme has been implemented as part of efforts to deal with low birth rates facing Korea, which should be more actively reviewed and accepted.

Therefore, considering the future prospects of neonatal health and birth-related behaviors in Korea, the following policies need to be executed in prevention and follow-up management in order to promote the growth of the population in quality and quantity.

1) Emphasis on Preconception Care

A rise in marriage age can have negative effects on pregnancies and deliveries following marriage by causing late childbearing issues, extending the fertile period from the first period to marriage, and thereby raising the possibility of artificial abortions or reproductive organ infections due to extramarital pregnancy.

Therefore, from the adolescent period when the first period begins, the public should acquire sufficient knowledge of reproductive health, thereby preventing unwanted pregnancies and making preparations for safe pregnancies/deliveries following marriage. The issue can be handled individually or by group, developing guidelines for reproductive health management before pregnancies in order to enhance the efficiency thereof.

2) Set National Goals to Prevent Adverse Birth Outcomes

As part of the mid-to-long term public health promotion plan and in relation to neonatal health, the Korean government has managed neonatal mortality, intensive care units for newborns, inborn metabolic disorder checkup rates, support for preterm babies in medical expenses, and the number of newborns for whom difficulties in hearing are selectively checked, at a national level. However, other than neonatal mortality, such indicators may simply act to measure and check not policy performances but project implementation performances. They can also be thought of as fragmentary.

Therefore, the indicators should be properly revised, with more

comprehensive indicators including related factors being chosen additionally.

3) Development of Pregnancy Risk Monitoring System

The social burden in preterm birth and low birth weight is especially high in underdeveloped nations, which means that failures to properly treat the babies have led to deaths or disabilities. Considering medical and social costs from the medical demand of high-risk newborns, expected physical disabilities, developmental disorders in mind/body, and mental pains, priorities should be given to preventing the occurrence of late childbearing-related high-risk newborns in advance.

Therefore, implementing active improvement measures, vulnerable classes should be identified through the continuous tracking of health/delivery behaviors of fertile women and the access of high-risk pregnant women and newborns to medical services.

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