
Disparity and Social Determinants of Preterm Birth in Taiwan - A Study of National Data

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Presenter Disclosures

Baai-Shyun Hurng

(1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose



Outline

- Background
- Objective
- Method
- Findings
- The way forward



Population and Health Statistics in Taiwan and US

	Taiwan	US
Total population	23.3 million (2012)	311.6 million (2011)
Population Density (Pop. Per km²)	644 (2012)	32 (2011)
GDP/capita, \$	20,386 (2012)	48,113 (2011)
Total Health Expenditure as % of GDP	6.6 (2010)	17.9 (2011)
Illiterate rate, (%) >=15yr	1.71 (2012)	1 (2011)
Life Expectancy at birth (years)	79.2 (2011)	78.4 (2011)
Male	76.0 (2011)	75.9 (2011)
Female	82.6 (2011)	80.9 (2011)
Population age 65 and above(%)	11.2 (2012)	13.1 (2011)
Total Fertility Rate	1.27 (2012)	2.1 (2011)
Crude birth rate(‰)	9.9 (2012)	13.8 (2011)
Neonatal mortality rate(‰)	2.3 (2012)	4.0 (2010)
Infant mortality rate(‰)	3.7 (2012)	6.1 (2011)

Source : 1. Statistical Yearbook of Interior, R.O.C 2. Statistical Yearbook of Department of Health, R.O.C.
3. WHO World Health Statistics 2013 4. WHO Global Health Observatory Data Repository
5. Statistics Canada 6. CIA The World FactBook
7. The World Bank 8. Directorate General of Budget, Accounting and Statistics, Executive Yuan, R.O.C.

What we have known about preterm birth?

■ Definition

- babies born alive before 37 weeks of pregnancy are completed.
- moderate to late preterm 32 to <37 weeks
- very preterm, 28 to < 32 weeks
- extremely preterm, <28 weeks

- The rates of preterm birth in most countries range from 5% to 18% of live births.




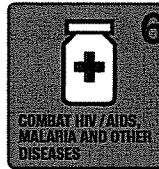
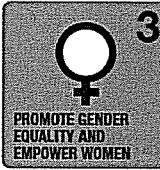
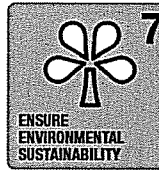
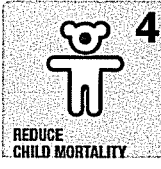



What we have known about preterm birth?

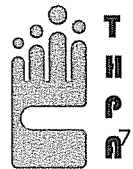
- 15 million babies are born too soon every year
 - More than 1 in 10 babies are born preterm, affecting families all around the world.
 - Over 1 million children die each year due to complications of preterm birth.
 - Many survivors face a lifetime of disability, including learning disabilities and visual and hearing problems.



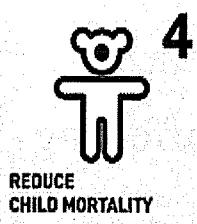
MDG and prevention and care of preterm births

Millennium Development Goal	Links to Preterm Birth	Millennium Development Goal	Links to Preterm Birth
 <p>1 ERADICATE EXTREME POVERTY AND HUNGER</p>	<ul style="list-style-type: none"> • Poverty is a risk factor for preterm birth • Women who were underfed or stunted as girls are at higher risk of preterm birth 	 <p>5 IMPROVE MATERNAL HEALTH</p>	<ul style="list-style-type: none"> • Family planning to avoid adolescent pregnancy and promote spacing births reduces the risk of preterm birth • Effective antenatal, obstetric and postnatal care for all pregnant women saves lives of mothers and babies
 <p>2 ACHIEVE UNIVERSAL PRIMARY EDUCATION</p>	<ul style="list-style-type: none"> • Education especially of girls reduces adolescent pregnancy, which is a risk factor for preterm birth • Age appropriate health education may reduce preconception risk factors 	 <p>6 COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES</p>	<ul style="list-style-type: none"> • Prevention and treatment before and during pregnancy of infectious and non-communicable diseases known to increase risk of preterm birth
 <p>3 PROMOTE GENDER EQUALITY AND EMPOWER WOMEN</p>	<ul style="list-style-type: none"> • Gender equality, education and empowerment of women improve their outcomes and their babies' survival 	 <p>7 ENSURE ENVIRONMENTAL SUSTAINABILITY</p>	<ul style="list-style-type: none"> • Ensured access to improved water and sanitation facilities to reduce transmission of infectious diseases
 <p>4 REDUCE CHILD MORTALITY</p>	<ul style="list-style-type: none"> • Newborn deaths account for 40% of under-5 mortality, which is the indicator for MDG4. Deaths from preterm birth have risen and now are one of the leading causes of under-5 deaths. 	 <p>8 A GLOBAL PARTNERSHIP FOR DEVELOPMENT</p>	<ul style="list-style-type: none"> • Identification of actions that key constituencies can take individually and together to mobilize resources, address commodity gaps and ensure accountability in support of RMNCH and preterm birth prevention and care

Born Too Soon: The Global Action Report on Preterm Birth. WHO, 2012.



Millennium Development Goals (1990- 2015)



GOAL 4: REDUCE CHILD MORTALITY

- Reduce under-5 mortality rate by two thirds
- Infant mortality rate by two thirds



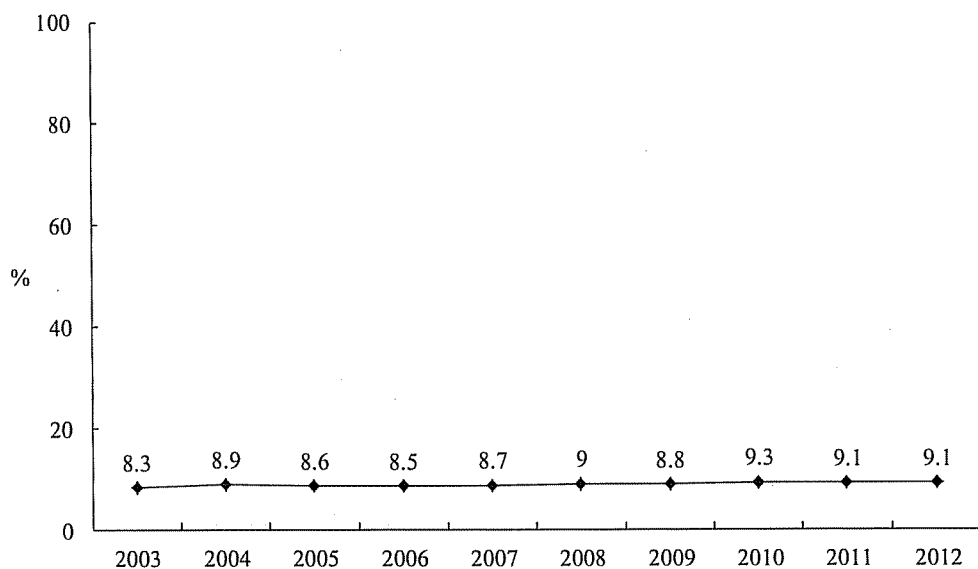
GOAL 5: IMPROVE MATERNAL HEALTH

Achieve universal access to reproductive health

- Adolescent birth rate;
- Antenatal care coverage (≥ 1 visit & ≥ 4 visits)



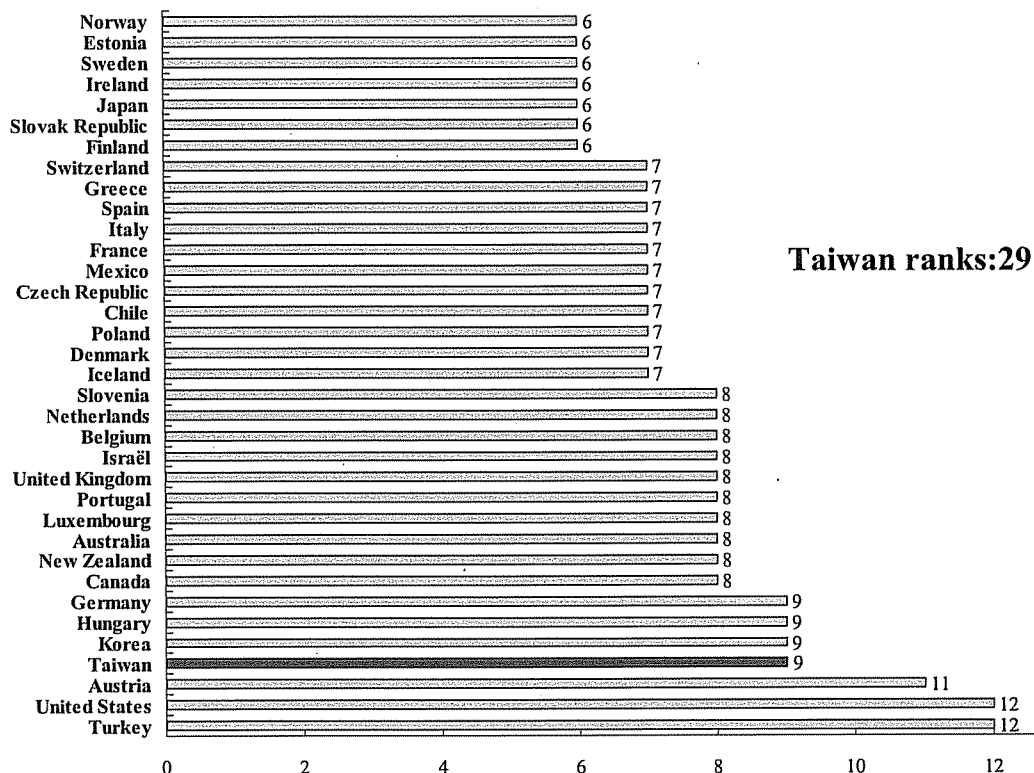
Proportions of preterm birth in Taiwan, 2003-2012



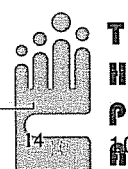
Source of data : Birth reporting data



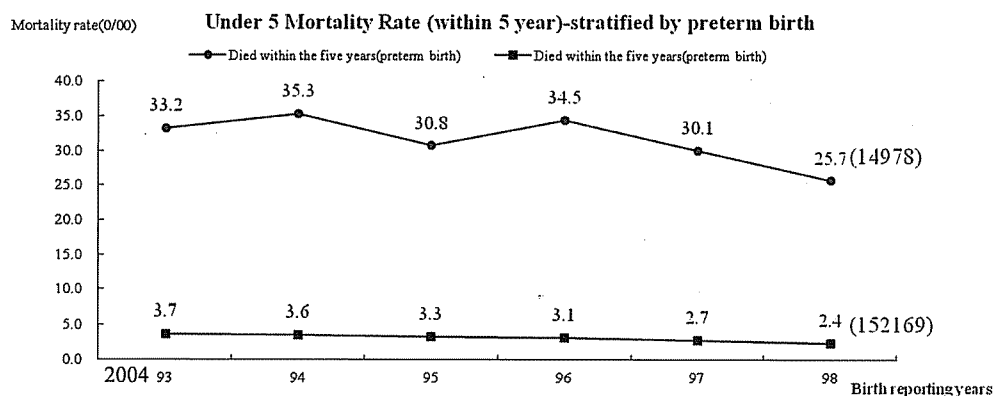
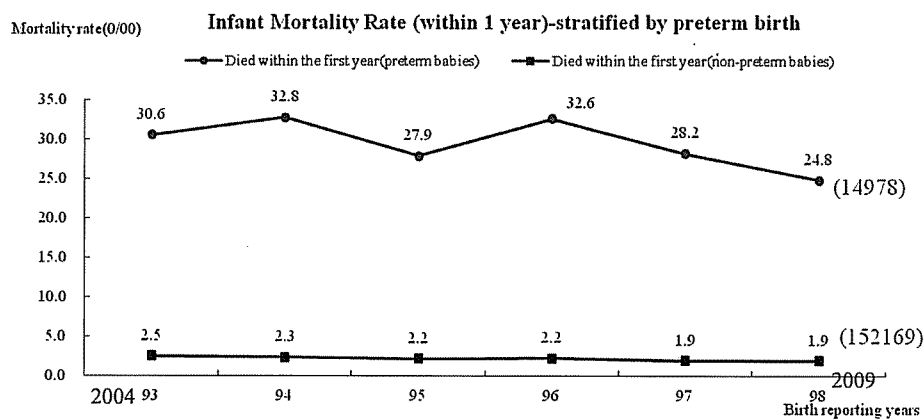
Preterm birth rate, comparison between Taiwan and the OECD countries in 2010



Source : WHO-2013 World Health Statistics 、 Ministry of Health and Welfare



Infant and Under 5 mortality-comparison between preterm and non-preterm babies



Objective of this study

- To investigate social determinants of health related to preterm births in Taiwan, so that we may intervene through a reinforcing maternal and child care delivery system.



Method 1/2

■ Source of data

- Birth Reporting Database (HPA/MOHW)
ID of mother / Birth outcome
- Birth Registration Database(MOI)
ID of newborn, parents
- Assisted Reproduction Database(HPA/MOHW)
ID of mother / service utilization data
- Antenatal Care Database(NHIA/MOHW)
ID of mother / service utilization data
- Death certificate data(MOHW)
ID of newborn



Method 2/2

- A total of 787,293 live births from 2006 to 2009 were included for analysis

■ Statistic strategies

- Contingency table and multivariable logistic regression model were applied



Preliminary findings



Descriptive analysis 1/2

Variables	Live birth infants		Less than 28 weeks		28-31 weeks		32-36 weeks		More than 37 weeks	
	n	n	%	n	%	n	%	n	%	
Total	737,438		0.3%		0.6%		7.8%		91.4%	
Year of birth										
2007	200,687	572	0.3%	1,088	0.5%	15,287	7.6%	183,740	91.6%	
2008	193,859	555	0.3%	1,096	0.6%	15,396	7.9%	176,812	91.2%	
2009	189,344	485	0.3%	1,039	0.5%	14,656	7.7%	173,164	91.5%	
2010	153,548	466	0.3%	877	0.6%	12,144	7.9%	140,061	91.2%	
Gender										
Male	385,161	1,150	0.3%	2,337	0.6%	32,362	8.4%	349,312	90.7%	
Female	352,277	928	0.3%	1,763	0.5%	25,121	7.1%	324,465	92.1%	
Birth weight (Gram)										
Less than 1000	2,112	1,696	80.3%	368	17.4%	48	2.3%	-	0.0%	
1000-1499	3,438	371	10.8%	2,128	61.9%	893	26.0%	46	1.3%	
1500-2499	50,000	11	0.0%	1,577	3.2%	25,542	51.1%	22,870	45.7%	
More than 2500	681,888	-	0.0%	27	0.0%	31,000	4.5%	650,861	95.4%	
No of Birth										
Singlefetal	718,972	1,666	0.2%	3,131	0.4%	46,823	6.5%	667,352	92.8%	
Twins or multiple birth	18,466	412	2.2%	969	5.2%	10,660	57.7%	6,425	34.8%	
Birth Defects										
No	733,756	1,956	0.3%	4,023	0.5%	56,942	7.8%	670,835	91.4%	
Yes	3,682	122	3.3%	77	2.1%	541	14.7%	2,942	79.9%	
Assisted Reproduction										
No	727,094	1,888	0.3%	3,677	0.5%	53,648	7.4%	667,881	91.9%	
Yes	10,344	190	1.8%	423	4.1%	3,835	37.1%	5,896	57.0%	
Cesarean										
No	473,237	1,153	0.2%	1,440	0.3%	26,314	5.6%	444,330	93.9%	
Yes	264,201	925	0.4%	2,660	1.0%	31,169	11.8%	229,447	86.8%	

Descriptive analysis 2/2

Variables	Live birth infants		Less than 28 weeks		28-31 weeks		32-36 weeks		More than 37 weeks	
	n	n	%	n	%	n	%	n	%	
Age of mother										
Less than 20 years	12,742	58	0.5%	101	0.8%	1,233	9.7%	11,350	89.1%	
20-24 years	89,614	190	0.2%	368	0.4%	6,193	6.9%	82,863	92.5%	
25-29 years	256,800	572	0.2%	1,084	0.4%	17,868	7.0%	237,276	92.4%	
30-34 years	270,774	816	0.3%	1,613	0.6%	21,234	7.8%	247,111	91.3%	
More than 35 years	107,508	442	0.4%	934	0.9%	10,955	10.2%	95,177	88.5%	
Original Nationality of the Mother										
ROC citizens (non-aborigine)	624,048	1,844	0.3%	3,638	0.6%	50,030	8.0%	568,536	91.1%	
Aborigine	22,703	129	0.6%	190	0.8%	2,318	10.2%	20,066	88.4%	
Non-Citizens	63,459	62	0.1%	169	0.3%	3,293	5.2%	59,935	94.4%	
Missing	27,228	43	0.2%	103	0.4%	1,842	6.8%	25,240	92.7%	
Mother education										
Less than junior high school	79,395	360	0.5%	594	0.7%	7,986	10.1%	70,455	88.7%	
Senior high school	217,989	671	0.3%	1,370	0.6%	18,256	8.4%	197,692	90.7%	
More than junior college	355,460	952	0.3%	1,884	0.5%	26,571	7.5%	326,053	91.7%	
Missing	84,594	95	0.1%	252	0.3%	4,670	5.5%	79,577	94.1%	
Mother living area (missing= 10)										
Main islands	719,152	1,994	0.3%	3,973	0.6%	55,872	7.8%	657,313	91.4%	
Mountain	7,325	40	0.5%	59	0.8%	776	10.6%	6,450	88.1%	
Remote islands	5,244	17	0.3%	33	0.6%	328	6.3%	4,866	92.8%	
Remote districts	5,707	27	0.5%	35	0.6%	506	8.9%	5,139	90.0%	
Frequency of prenatal Care										
0-4 times	46,195	1,780	3.9%	2,066	4.5%	10,619	23.0%	31,730	68.7%	
5-8 times	143,515	296	0.2%	1,987	1.4%	32,799	22.9%	108,433	75.6%	
More than 9 times	547,728	2	0.0%	47	0.0%	14,065	2.6%	533,614	97.4%	
Prenatal ultrasound										
No	80,788	623	0.8%	1,111	1.4%	11,564	14.3%	67,490	83.5%	
Yes	656,650	1,455	0.2%	2,989	0.5%	45,919	7.0%	606,287	92.3%	



Simple logistic regression 1/2

Variables	OR(95%CI)	p-value
Year of birth		
2007	ref.	
2008	1.05(1.02-1.07)	<.0001
2009	1.01(0.99-1.04)	0.2660
2010	1.04(1.02-1.07)	0.0004
Gender		
Male	1.20(1.18-1.22)	<.0001
Female	ref.	
Birth weight (Gram)		
Less than 1000	>999.999	
1000-1499	>999.999	
1500-2499	14.81(14.8-14.81)	<.0001
More than 2500	ref.	
Birth number		
Single fetal	ref.	
Twins or multiple birth	24.23(23.48-25.01)	<.0001
Birth Defects		
No	ref.	
Yes	2.68(2.48-2.91)	<.0001
Artificial Reproduction		
No	ref.	
Yes	8.51(8.18-8.86)	<.0001
Cesarean		
No	ref.	
Yes	2.33(2.29-2.37)	<.0001



Simple logistic regression 2/2

Variables	OR(95%CI)	p-value
Age of mother		
Less than 20 years	1.49(1.41-1.58)	<.0001
20-24 years	0.99(0.96-1.02)	0.4994
25-29 years	ref.	
30-34 years	1.16(1.14-1.19)	<.0001
More than 35 years	1.58(1.54-1.61)	<.0001
Original Nationality of the Mother		
ROC citizens (non-aborigine)	ref.	
Aborigine	1.35(1.29-1.40)	<.0001
Non-Citizens	0.60(0.58-0.62)	<.0001
Missing	0.81(0.77-0.85)	<.0001
Mother education		
Less than junior high school	1.41(1.37-1.44)	<.0001
Senior high school	1.14(1.12-1.16)	<.0001
More than junior college	ref.	
Missing	0.70(0.68-0.72)	<.0001
Mother living area (missing= 10)		
Main islands	ref.	
Mountain	1.44(1.35-1.55)	<.0001
Remote islands	0.83(0.74-0.92)	0.0004
Remote districts	1.18(1.08-1.28)	0.0003
Frequency of prenatal Care		
0-4 times	17.24(16.80-17.69)	<.0001
5-8 times	12.23(11.98-12.49)	<.0001
More than 9 times	ref.	
Prenatal ultrasound		
No	2.37(2.32-2.42)	<.0001
Yes	ref.	



Multivariate logistic regression 1/2

Variables	Model 1	Model 2	Model 3
	OR(95%CI)	OR(95%CI)	OR(95%CI)
Year of birth			
2007	ref.		
2008	1.04(1.01-1.06)	1.04(1.02-1.06)	1.05(1.03-1.08)
2009	1.01(0.98-1.03)	1.01(0.98-1.03)	1.01(0.99-1.04)
2010	1.04(1.02-1.07)	1.03(1.01-1.06)	1.04(1.01-1.07)
Gender			
Male	-	-	1.23(1.21-1.25)
Female	-	-	ref.
No of birth			
Single	-	-	ref.
Twins or multiple birth	-	-	21.59(20.85-22.36)
Cesarean			
No	-	-	ref.
Yes	-	-	2.72(2.50-2.96)
Assisted Reproduction			
No	-	-	ref.
Yes	-	8.01(7.69-8.35)	1.60(1.51-1.69)
Age of mother			
Less than 20 years	1.13(1.06-1.20)	1.13(1.07-1.20)	1.19(1.12-1.26)
20-24 years	0.93(0.90-0.96)	0.94(0.91-0.97)	0.95(0.92-0.98)
25-29 years	ref.	ref.	ref.
30-34 years	1.19(1.17-1.21)	1.14(1.11-1.16)	1.11(1.08-1.13)
More than 35 years	1.58(1.54-1.61)	1.39(1.35-1.42)	1.42(1.38-1.45)



Multivariate logistic regression ^{2/2}

Variables	Model 1	Model 2	Model 3
	OR(95%CI)	OR(95%CI)	OR(95%CI)
Original Nationality of the Mother			
ROC citizens (non-aborigine)	ref.	ref.	ref.
Aborigine	1.17(1.11-1.22)	1.18(1.13-1.24)	1.21(1.15-1.27)
Non-Citizens	0.73(0.67-0.80)	0.73(0.67-0.79)	0.72(0.66-0.79)
Mother education			
Less than junior high school	1.50(1.46-1.54)	1.55(1.51-1.60)	1.63(1.59-1.68)
Senior high school	1.20(1.18-1.22)	1.24(1.21-1.26)	1.28(1.26-1.31)
More than junior college	ref.	ref.	ref.
Mother living area (missing= 6)			
Main island	ref.	ref.	ref.
Mountain	1.15(1.06-1.24)	1.16(1.07-1.25)	1.18(1.08-1.28)
Remote islands	0.85(0.76-0.94)	0.85(0.76-0.94)	0.85(0.76-0.94)
Remote districts	1.11(1.01-1.21)	1.12(1.03-1.23)	1.15(1.05-1.26)



Summary of the findings

- In spite of the well-recognized and **universal coverage National Health Insurance** and well-established **prenatal care services**, gaps in rates of preterm birth were observed.
- The characteristics of **high risk** mothers were **teenager**, those who **give birth after age 30**, with **lower educational attainment**, **indigenous or living in mountain and remote area**.
- Mothers who used **assisted reproductive technology** for conception, which implied likelihood of multiple pregnancies, also had higher risk of preterm births.



Challenges

- **The reduction in infant mortality is falling behind MDG target (2015, 2.5 ‰)**
 - **Major causes of death : congenital abnormality, premature related death, injury/SIDS**
- **Adolescence pregnancy**
- **Health inequality among indigenes and some counties**
- **Multiple births, premature labour & LBW caused by ART**

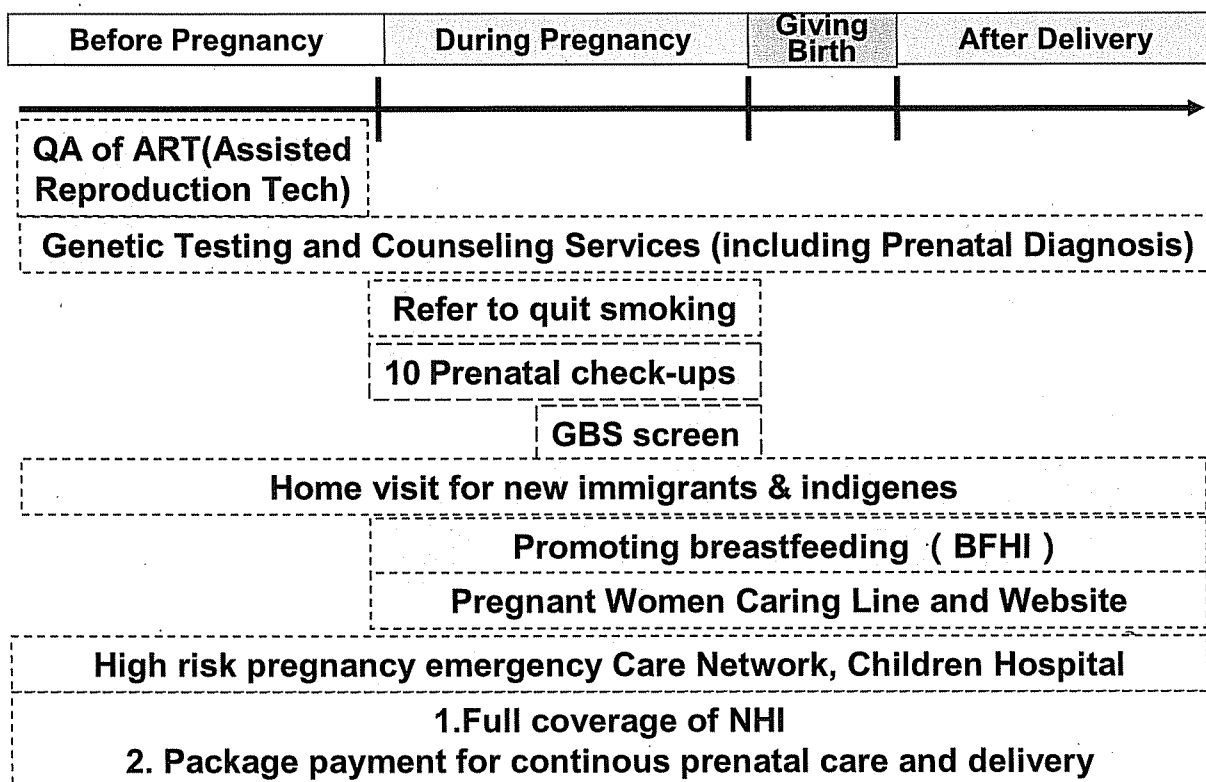


The way forward

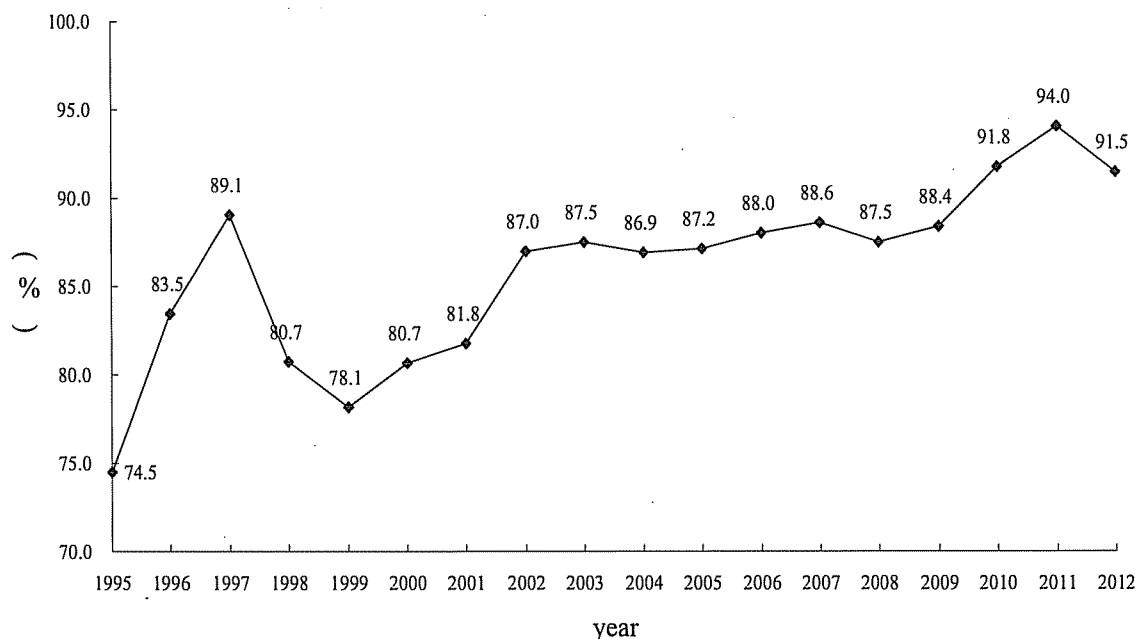
- **Comprehensive approaches that enable timely identification of high risk mothers and well-delivery of services to the need are essential to prevent pre-term birth and may subsequently reduce avoidable infant mortality.**



Comprehensive Maternal Cares



Utilization Rate of Prenatal Examinations

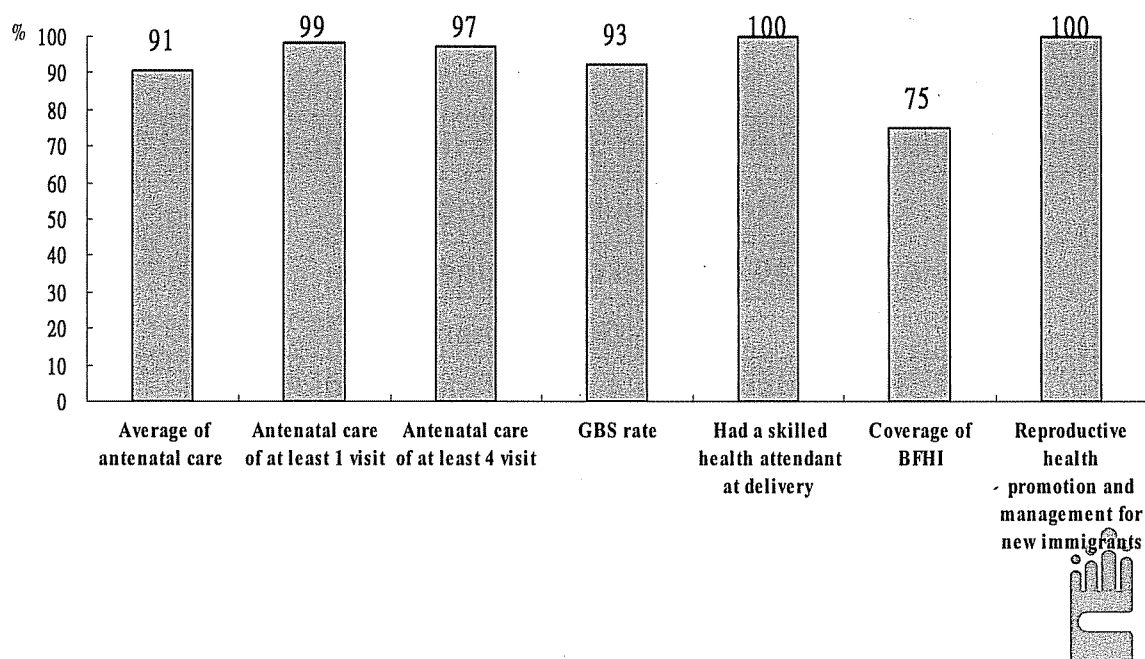


Source: Data for 1995-2005 is taken from the Bureau of National Health Insurance & data for 2006-2012 is based on HPA calculations

Average utilization rate: the number of prenatal examinations / the number of births multiplied by 10 prenatal tests



The coverage of maternal cares, 2012



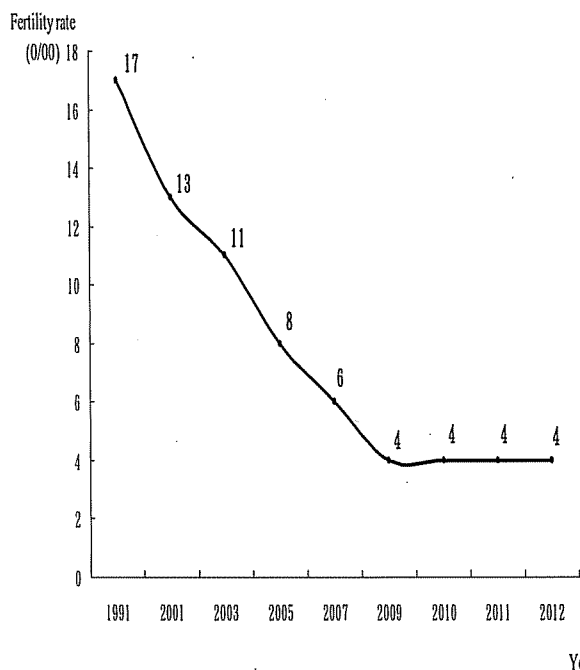
Adolescent Sexual Health Services

- Under the regulations, establish and provide multiple means of sexual health counseling and medical services
 - Adolescent sexual health **counseling network, website** for Adolescent (sexual health e-Academy)
 - **Cooperate with schools** to provide sexual health counseling
 - 39 medical institutes in 16 counties introduce “No. 9 **Outpatient Services** for Teen’s Happiness”
- Strengthen **inter-ministerial cooperation**

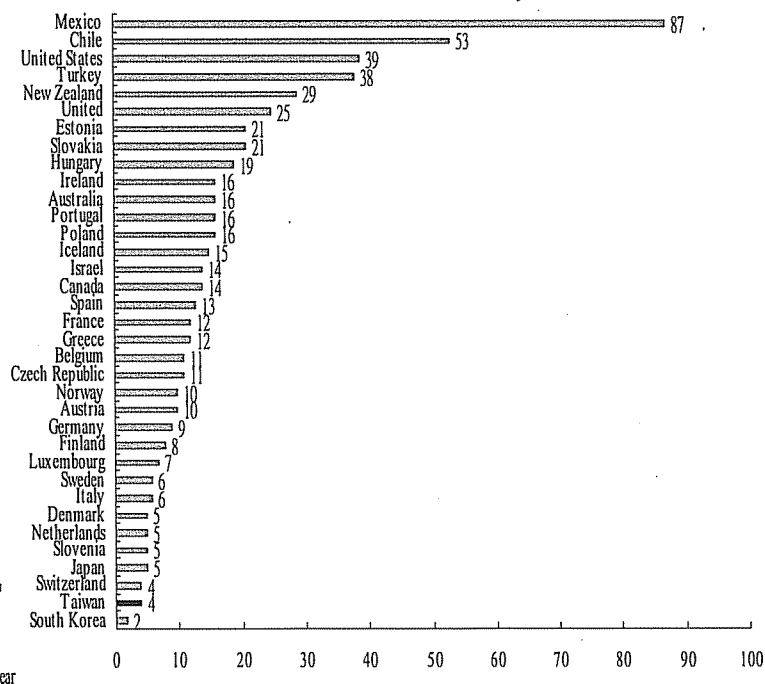


The fertility rate of female adolescent aged 15-19 of Taiwan and 34 OECD countries

Fertility rate of female adolescent, 1951-2012

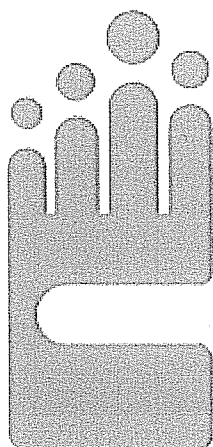


Comparison among Taiwan & 34 OECD countries, 2012



Source: 2012 PRB, Ministry of the Interior; 2013 World Health Statistics

**Promotion.
Prevention.
Protection.
Participation!**



**Taiwan
Health
Promotion
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