TORONTO **STAFF REPORT**

April 26, 2004

To: Board of Health

From: Dr. Barbara Yaffe, Acting Medical Officer of Health

Subject: Low Birth Weight

Purpose:

This report describes the issues pertaining to Low Birth Weight (LBW) in Toronto. It compares Toronto data with the rest of Ontario and discusses disparities in LBW rates within Toronto. The report also discusses the overall complexity of this significant health issue as well as the potential link between periodontal infections in pregnant women and the risk of preterm birth (PTB). In addition, Toronto Public Health (TPH) programs, strategies, and initatives related to LBW are described.

Financial Implications and Impact Statement:

There are no financial implications arising from this report.

Recommendations:

It is recommended that:

(1) the Board of Health advocate with the Honourable Carolyn Bennett, Minister of State for Public Health, to ensure that health promotion programs are included within the new Canadian Public Health Agency and specifically to maintain and enhance Federal Government support for the Canada Prenatal Nutrition Program (CPNP);

(2) the Board of Health write to Health Canada to express its support for the CPNP and advocate for increased funds for CPNP, in particular to support priority access for teens at CPNP sites;

(3) the Board of Health advocate to the Ontario Minister of Children and Youth Services for adequate funding for the Healthy Babies Healthy Children (HBHC) program to provide service to high-risk pregnant women in the City of Toronto;

(4) the Board of Health request that the Office of the Registrar General (ORG) outline their plan for ensuring timely, complete, and accurate birth data that is useful for public health program planning and that links to the development and implementation of the Niday Perinatal Database for the Greater Toronto Area (GTA);

(5) the Board of Health request the Ontario Minister of Children and Youth Services to provide resources to the Central East Health Information Partnership to continue developing the Niday Perinatal Database for the Greater Toronto Area (GTA) to enable health units to conduct timely analysis of comprehensive birth data;

(6) the Board of Health urge the Canadian Institute of Health Research (CIHR) to fund research which will contribute to an increased understanding of the differential effects of socioeconomic disparities on LBW and the biological mechanisms and modifiable factors associated with differences in rates of LBW among ethno-racial communities in Toronto;

(7) the Medical Officer of Health keep the Board of Health informed of the findings pertaining to the potential link between periodontal disease and preterm birth, with a view to identifying possible strategies for public health dental services, and share these findings with Shelter, Housing and Support Division and Toronto City Council;

(8) the Board of Health advocate to the Ministry of Health and Long-Term Care that there be a change to the care of pregnant women so that dental care becomes an integral component of obstetrical care covered by OHIP; and

(8) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto.

Background:

Toronto Public Health (TPH) is mandated to provide Reproductive Health programming with the goal to support healthy pregnancies. One of the objectives within this program is to reduce the low birth weight (LBW) rate, which is the proportion of newborns weighing less than 2,500 grams (5.5 pounds) at birth (1).

The rate of LBW is used internationally as an indicator to compare the health status of populations (2). LBW babies tend to have significant health and developmental challenges, require a disproportionate amount of health care and other specialised services, and remain prone to health difficulties into late adulthood.

This report discusses factors associated with LBW, data specific to Toronto, as well as TPH programs, strategies and initiatives related to LBW. Areas in which additional information is required to inform further planning and action are also identified.

In addition, at its meeting on September 5, 2003 the Children and Youth Action Committee (CYAC) endorsed the following motions:

> "That there be a change to the care of pregnant women so that dental care becomes an integral component of obstetrical care covered by OHIP, and that this recommendation be forwarded to the Medical Officer of Health, Roy Romanow at the Atkinson Foundation, and the Ontario Minister of Health.
>
> The Medical Officer of Health be requested to submit a report to City Council on the findings of new research available on the effect of gum disease on low birth weight babies and that the Shelter, Housing and Support Division is aware of these findings."

This report addresses both the CYAC motions and broader issues pertaining to LBW.

Comments:

Health Consequences of LBW:

LBW can result from preterm birth (PTB), which refers to a birth before 37 weeks gestation, or intrauterine growth restriction (IUGR), in which the weight of the infant or fetus is less than the norm for gestational age, or a combination of the two.

LBW babies are more likely to die in infancy than babies with a healthy birth weight, or to experience health and developmental problems such as cerebral palsy, seizure disorders, learning disabilities, and an increased risk of sudden infant deaths (3). LBW is also associated with cardiovascular and other related diseases later in life (4). The high risk of poor health that LBW imposes on infants therefore contributes to later health issues found in adult populations, and hence to challenges to population health overall.

LBW babies require a disproportionate amount of health care and other services. For each preterm LBW infant born in Canada, the cost of neonatal intensive care and post neonatal care to one year of age was conservatively estimated at $48,183 per surviving infant in 1995. The lifetime cost for permanent disabilities was estimated to be $676,800 per preterm LBW infant (3).

Contributing Factors Related to LBW:

TPH recently undertook an analysis of LBW in order to more effectively address this complex issue. Toronto data on LBW as well as a TPH sponsored literature review informed this analysis. The literature review was conducted by Dr. Prakeshkumar Shah and Dr. Arne Ohlsson from the Evidenced Based Neonatal Care & Outcomes Research Unit, Department of Pediatrics, Mount Sinai Hospital, and is titled "Literature Review of Low Birth Weight, Including Small for

Gestational Age and Preterm Birth" (3). The Executive Summary of the literature review is attached as Appendix 1. The full literature review is on file in the City Clerk's Office.

The literature review identified that many complex and interacting factors contribute to LBW, including genetic factors, uterine factors, previous history of a preterm or LBW birth, multiple births, maternal age, low socioeconomic status, race/ethnicity, maternal malnutrition, chronic stress, and tobacco use/environmental tobacco smoke (ETS) exposure. Although some of these factors are non-modifiable, many are modifiable. In addition, the literature review identified that the underlying causal mechanisms related to singleton LBW are not yet well understood (3).

Oral Health and LBW:

Shah and Ohlsson (2002) identified periodontal infection as a determinant with a possible association with LBW requiring additional research (3). The effect of dental health on general health and well being has long been recognized. Links between poor oral health, chronic diseases and PTB are emerging through recent research. Studies conducted in the US have demonstrated that periodontal (gum) disease is a newly identified obstetric risk factor for PTB and IUGR (5-7). Mothers with periodontal diseases early in pregnancy or worsening periodontal status during pregnancy, appear to be at a 2 to 8 fold increased risk for PTB compared to mothers without these problems (8). However, studies conducted on Bangladeshi patients in London have failed to find an association between maternal clinical signs of periodontitis and PTB, suggesting that there may be significant ethno-racial or geographic differences in attributable risks (9).

Findings from early pilot periodontal treatment studies in pregnant women point to a potential five-fold reduction in the rate of PTB. Periodontal treatment during pregnancy is not only safe, but may contribute to improved pregnancy outcomes (10). There are similar findings from a pilot intervention study done in Alabama (11). The results from this study were reported as "Treatment of gums cuts preterm births – Study of women with periodontitis finds 84% reduction", in the National Post, August 26, 2003. This newspaper article raised public interest in the role of periodontal disease as a contributory factor to PTB. The treatments that were applied in this study included scaling and root planing of the teeth. This pilot intervention research is part of a larger, more detailed study, which is still in progress.

Profile of LBW in Toronto:

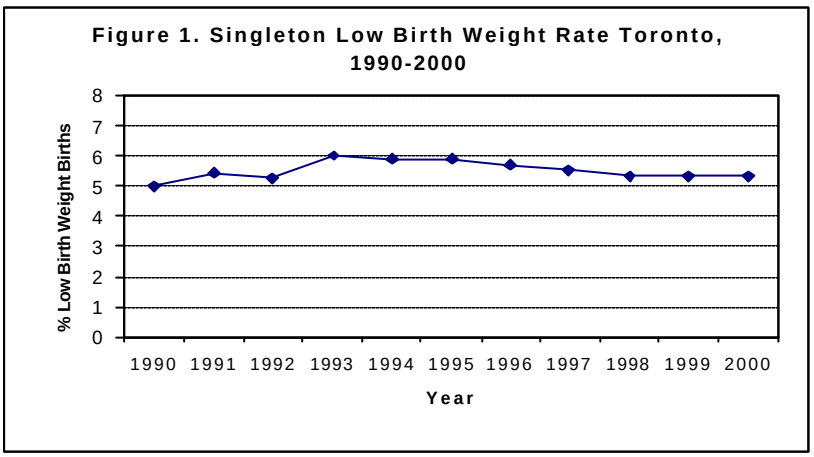
The rate of LBW among total live births and singleton live births is consistently higher in Toronto than in the rest of Ontario. The total LBW rate includes multiple births (i.e., twins, triplets and other multiples), which accounted for approximately 22.5 % of LBW births in Toronto in 2000, the most recent year for which data are available.

One objective of the Ontario Ministry of Health & Long-Term Care Mandatory Health Programs and Services Guidelines (1997) is to reduce the LBW rate (under 2500 grams or 5.5 pounds) to 4% by 2010 (1). These guidelines are currently under review. Recognizing the contribution of multiple births and preterm births to the LBW rate, the revised (draft) Reproductive Health program focuses on full term singleton infants less than 2,500 grams (12). Data presented in the

remainder of this report focus on singleton LBW rates as these are the rates tracked by public health units in Ontario.

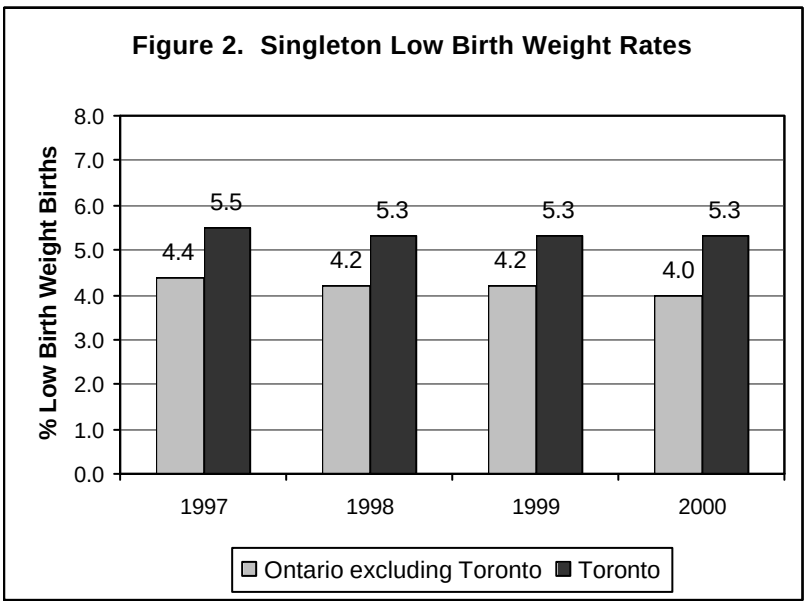
During the last eleven years for which data are available (1990 to 2000), the number of singleton births to Toronto residents peaked in 1995 with 33,791 births. Since then, there has been a steady decrease, with 30,027 singleton births reported in 2000.

Toronto's singleton LBW rate, while improved between 1993 and 1998, levelled off at 5.3% between 1998 and 2000 (see Figure 1).



Source: Vital Statistics Data, Ontario Live Birth Database, HELPS, Public Health Branch, Ontario MOHLTC
Prepared by: Health Information and Planning, Toronto Public Health, March 2004.

However, Toronto's singleton LBW rate has been consistently higher than the rate for the rest of Ontario. In 2000, Toronto's rate of 5.3% was approximately 32.5% higher than the rate for the rest of Ontario (see Figure 2).



Source: Vital Statistics Data, Ontario Live Birth Database, HELPS, Public Health Branch, Ontario MOHLTC
Prepared by: Health Information and Planning, Toronto Public Health, March 2004.

Toronto's LBW burden is not evenly distributed across populations within the City. TPH has identified significant disparities in singleton LBW rates across geographical areas, neighbourhood income levels, maternal country of birth, and maternal age groupings.

A recent Toronto District Health Council (TDHC) report found geographical disparities in singleton LBW rates when data were analysed using newly created Toronto planning areas. The singleton LBW rates (1996-1997 combined) ranged between 3.8% and 6.9% across the 15 smaller planning areas (13). This indicates that within the City there is almost a two-fold (1.8) difference in singleton LBW rates from one area to another. The TDHC analysis does not explain which factors account for these geographical disparities. However, TPH analysis of singleton LBW data suggests that socio-demographic factors such as neighbourhood income, maternal country of birth, and maternal age may be contributing to the disparities.

In 1996 the singleton LBW rate in the lowest income areas was approximately 80% higher than that of the highest income areas (1.8 fold difference). This disparity appears to have narrowed somewhat since then. In 2000 there was a 40% (1.4 fold) difference in singleton LBW rates between the lowest and highest income areas. The narrowing of the disparity could be due to changes in the age or ethnic characteristics of mothers living in different Toronto neighbourhoods, changes in modifiable factors which contribute to LBW births, changes in access to programs, services, and other supports or some combination of all these factors. It could also be related to missing data due to the costs of birth registration, which is more likely to affect low-income communities, or an increase in the number of high-risk mothers not reporting a postal code. These data quality issues are discussed later in the report.

In 2000 there was also considerable variation in singleton LBW rates in Toronto according to mothers' country of birth using groupings based on World Bank Regions (3.1 % to 7.5 %), and maternal age, with the highest rates at the extremes of maternal age. Adolescents less than 20 years of age continued to have the highest rate of singleton LBW (8.5%) of all age groups.

There is an urgent need to identify factors that contribute to Toronto's high overall rate of LBW and to disparities in rates across the city. Given its health consequences, and the preventable nature of some of its contributing factors, the rate of LBW in Toronto is a significant health issue which must be addressed.

TPH Programming Related to LBW:

The Provincial Mandatory Health Programs and Services Guidelines provide direction to health units regarding strategies, approaches and interventions related to LBW (1, 12). As discussed, LBW is a complex issue with many inter-related modifiable and non-modifiable contributing factors. TPH has a critical role to play with respect to LBW prevention. However, addressing LBW requires the intervention of many stakeholders including family physicians, midwives, nurses, nutritionists, dietitians, obstetricians, pediatricians, neonatologists, and organizations such as community health centers and Best Start, Ontario's Maternal Newborn & Early Child Development resource centre.

In 2003, TPH completed a redesign of the Reproductive Health program. During this review, LBW was identified as an important issue. Toronto data, literature regarding contributing factors

and effective interventions, and existing TPH programming were reviewed. Based on this analysis, decisions were made to: (a) strengthen existing programming to reach people of reproductive age as well as all pregnant women and (b) continue programming directed towards women with high rates of LBW or risk factors for LBW.

Shah and Ohlsson (2002) identified that it is challenging to identify women who will give birth to a LBW baby at an individual level. They also suggested that healthy lifestyle behaviours and reduction of exposure to risk conditions prior to pregnancy (that is, during the preconception period) as well as during pregnancy will likely contribute to healthy birth outcomes, including reduction in rates of LBW (3).

Factors such as tobacco use/exposure to ETS, maternal malnutrition, a variety of infections including HIV infection, heavy alcohol use, and cocaine use have a proven association with LBW. The literature also suggests that factors such as low prepregnancy weight, inadequate weight gain during pregnancy, periodontal disease, marijuana use, environmental pollution, and occupational hazards have a possible association with LBW; however further research is needed (3).

The comprehensive literature review undertaken by Shah and Ohlsson (2002) identified four interventions with strong evidence of effectiveness in preventing LBW. An additional seven interventions were identified as having probable evidence of effectiveness and ten interventions which may be effective were identified. A complete listing of contributing factors and interventions/strategies identified in Shah and Ohlsson's (2002) literature review can be found in Appendix 1. Information regarding selected interventions/strategies is highlighted in the next section as appropriate.

1. TPH Programs for People of Reproductive Age and Pregnant Women:

TPH has a wide range of programming and policy initiatives directed towards the entire population of reproductive age in areas such as tobacco and other substance use, nutrition and healthy weights including the importance of a balanced nutritious diet, HIV infection, exposure to environmental toxins and occupational hazards, and healthy workplaces. TPH has identified the need to strengthen reproductive health messages in these areas in order to reduce the risk of LBW births and develop population-based strategies directed specifically to pregnant women regarding issues such as smoking, ETS exposure, and balanced nutritious diets during pregnancy.

Currently, a coordinated approach for addressing preterm labour does not exist in Toronto. TPH is planning to collaborate with key stakeholders (e.g., physicians, other primary health care providers (e.g., midwives and nurse practitioners), other nurses and pregnant women) to support initiatives that help all pregnant women recognize the signs and symptoms of preterm labour and respond by seeking urgent medical attention. Although this initiative will not reduce the risk of preterm delivery, it will permit proper medical evaluation and management, including the timely administration of glucocorticoids which improve neonatal outcomes. Planning related to this initiative has just begun. Given the number of primary health care providers in Toronto, extensive collaboration and outreach will be required. As this initiative is further developed, additional resources may be needed.

2. Priority Populations:

There are four priority populations for TPH programs pertaining to LBW. These are pregnant adolescents, pregnant women of low socio-economic status (SES) experiencing chronic stress, pregnant women who are undernourished, and pregnant women who smoke.

i) Pregnant Adolescents

In 2000, Toronto adolescents aged 19 and under had the highest rate of singleton LBW (8.5%). The literature suggests that physiological, hormonal, and developmental factors, an increased incidence of risk factors including unplanned pregnancies, and delays in initiating prenatal care, contribute to higher rates of LBW among adolescents. A combination of strategies such as health education, psychosocial support, linkage with antenatal care, referral to community resources, and provision of transportation for health care access have been demonstrated to be effective in preventing LBW among adolescents (3).

ii) Pregnant Women of Low Socio-Economic Status (SES) Experiencing Chronic Stress

A disproportionate number of LBW babies in Toronto are born in low-income areas. Multi-component interventions are needed for low-income women with specific risk factors (3). Such interventions include: provision of antenatal care with individualized assessment and intervention regarding specific risk factors, provision of social support for women experiencing chronic stress, and screening mothers with a previous history of LBW for infection, treatment of infection, and diagnosis and management of medical conditions.

iii) Pregnant Women who are Undernourished

Maternal malnutrition has a proven association with LBW. In fact, inadequate nutrition is the most common cause of impaired fetal growth. Malnutrition may cause stress in the fetus, which is an important factor in PTB. Multiple factors including socioeconomic status, stress, and lifestyle behaviours may affect the nutritional status of pregnant women. An intergenerational effect aggravated by factors associated with poor socio-economic status has been observed (3).

The literature review suggested that promotion of a balanced nutritious diet for all pregnant women has strong evidence of effectiveness in preventing LBW and that the nutritional status of all pregnant women should be assessed. It also suggested that provision of nutritious food to mothers identified as having limited resources to meet the nutritional demands of pregnancy may be beneficial. Nutritional support can be provided in a variety of ways and there is a need to determine the most effective strategies to provide such advice (3).

iv) Pregnant Women who Smoke

Tobacco use and exposure to ETS are determinants with a proven association with LBW (3). There are no Toronto-specific data regarding smoking during pregnancy. However, 2001 combined data from three Health Units in the GTA (including Toronto) showed that 17.8 % of the women interviewed smoked prior to pregnancy, 10.6 % smoked in the first three months of pregnancy, 9.6 % smoked during the third to sixth months of pregnancy, and 8.9 % smoked

during the last three months of pregnancy. At each time period the rates were higher among Canadian born women compared to foreign-born women (3).

Smoking cessation and relapse prevention as a routine component of prenatal care has strong evidence of effectiveness in preventing LBW. Although pregnant women are provided with information and advice regarding smoking during pregnancy, smoking cessation interventions are not routinely offered during prenatal care. Moreover, the literature suggests that there are limitations in the preparation and training of health care providers regarding such interventions (3).

TPH is reviewing specific programs regarding smoking cessation and relapse prevention during pregnancy. TPH is developing an action plan regarding smoking cessation and relapse prevention during pregnancy that may involve working with community partners.

3. TPH Multi-component Programs for Priority Populations:

As previously mentioned, Shah and Ohlsson (2002) identified that there are multiple, interacting determinants of LBW and suggested that intervention programs should address these (3). Four TPH multi-component programs are directed towards the identified priority populations: Healthiest Babies Possible (HBP), the Canada Prenatal Nutrition Program (CPNP), the Healthy Babies Healthy Children Program (HBHC) and the At-Risk Homeless Pregnant and Parenting Women's Project. These programs, several of which are provided in partnership with community agencies, have a number of objectives including the prevention of LBW.

i) Healthiest Babies Possible (HBP)

HBP is a cost shared one-to-one nutrition education and counselling program that is provided in approximately 65 community based sites. Pregnant women who meet the eligibility criteria, receive nutrition education and counselling, prenatal vitamins, food coupons, and interventions and referrals regarding other risk factors. In 2002, 1,160 women completed the program, with a LBW rate of 4.5%. The program is delivered by TPH Registered Dietitians (RDs), in cooperation with Public Health Nurses (PHNs) and Family Home Visitors (FHVs) from the HBHC Program. An evaluation of the HBP program is currently being planned.

ii) The Canada Prenatal Nutrition Program (CPNP)

CPNP is a comprehensive community-based program that supports pregnant women who face conditions of risk that threaten their health and the development of their babies. This includes women living in poverty, teens, women who use alcohol, tobacco or other harmful substances, women living in violent situations, and women who are socially or geographically isolated or with limited access to health services.

In Toronto, seven geographically based coalitions funded by Health Canada oversee 41 CPNP sites. In collaboration with community agencies and Health Canada, TPH provides Manager, PHN, Registered Dietitian and interpreter services support. CPNP provides weekly prenatal support programming which includes food and nutritional supplements, education regarding factors related to healthy pregnancy outcomes, counselling, and other supports to approximately

4,000 participants annually. Community agencies provide nursing, dietitian and other professional supports through CPNP sites. However, over time, community agency support to CPNP sites has decreased. Although TPH has reallocated some of its existing CPNP resources to attempt to fill the gaps, CPNP sites currently require additional resources to meet program needs. TPH will continue to work with CPNP coalitions to advocate for increased funding for enhanced program resources.

TPH is also involved in four collaborative CPNP programs directed towards teens. In order to reach more at risk pregnant teens TPH is working with local CPNP coalitions to advocate for teens to receive priority access to programming at CPNP sites.

As the new Canadian Public Health Agency is created, the Population and Public Health Branch of Health Canada will likely become part of this agency. TPH is concerned that the current focus on health protection issues may result in health promotion programs such as CPNP not receiving sufficient or timely attention.

iii) Healthy Babies Healthy Children Program (HBHC)

HBHC is a 100% provincially funded prevention/ early intervention program designed to help families promote healthy child development. Although HBHC does not have a specific goal to reduce LBW, it includes a number of services directed towards promoting healthy birth outcomes. This includes a universal prenatal screening component to identify families at risk and ensure they are referred to service before their baby is born. In 2003 TPH screened 1,942 pregnant women, identifying 40% of them at risk. This is a substantial increase over 2002 but falls considerably short of the universal target. Due to HBHC funding shortfalls, there are insufficient resources to increase screening and to work with other prenatal care providers (e.g. family physicians, community health centres) to establish prenatal screening protocols. The HBHC program also includes PHN and FHV home visiting to high-risk prenatal women to provide education, counselling and referral. In 2003, 500 women received HBHC high-risk prenatal home visiting. Provincial funding shortfalls limit the program's ability to provide service to all high-risk pregnant women.

iv) At-Risk Homeless Pregnant & Parenting Women Project

A five year Ontario Early Child Development Initiative (ECDI) grant contributes 100% funding for one PHN and HBHC funds a second PHN for the At-Risk Homeless Pregnant & Parenting Women project until 2006. The two PHNs provide a combination of strategies and interventions, in collaboration with selected shelters and youth serving agencies, including intensive one-to-one services, sustained outreach and service co-ordination for homeless young women who are pregnant. Development of a specialized network of service providers and partner agencies has supported fast tracking of high-risk pregnant women to obstetrical, mental health and medical services. Pathways to Healthy Families are providing one to one addictions counselling. Project PHNs provide the young women with food coupons and support the development of food preparation skills to enhance food security. Young women are referred to HBP or CPNP for additional nutritional support.

As of October 2003, approximately 120 homeless pregnant women had been reached since the project's inception in 2002. Due to limited resources, the target group for referral focuses on homeless pregnant women under age 29, in the South and East Regions of Toronto.

4. TPH Dental Services for High-Risk Pregnant Women:

In 2002 TPH provided basic dental services to approximately 100 – 150 low-income, high-risk pregnant women in the HBP program. These clients must have a dental condition requiring treatment. There are no preventive/educational public health dental services for these clients. However, if the findings of recent pilot studies are corroborated by future comprehensive clinical research studies, then dental services, in particular gum treatment for pregnant women, may be a cost-effective way to reduce PTB.

Future Initiatives:

The LBW issue remains complex, due in part to data limitations and incomplete understanding of the factors underlying differences in LBW rates across the city. Several areas have been identified where advocacy and/or research is required in order to obtain a more complete understanding of LBW.

i) Obtaining timely, accurate, and complete data on LBW

The data collected on births in Toronto are not complete and present serious challenges to accurately monitoring LBW information and making meaningful comparisons over time and place. Given that complete, accurate, and timely data are necessary to monitor trends and disparities in LBW rates, a concerted effort for estimating the true incidence of singleton LBW and related risk factors in Toronto is warranted.

The Ontario Live Birth Database, administered by the provincial Office of the Registrar General (ORG), Ministry of Consumer and Business Services, has been the primary source of live birth data, which are used to calculate LBW rates. However, there are concerns regarding the timeliness and accuracy of this database. Currently, there is approximately a three-year delay before TPH receives annual live birth data. In addition, there are concerns regarding the number of births missing from the database, the incomplete information entered into the database (particularly missing postal codes or postal codes which cannot be coded to Toronto geography), as well as inaccuracies in the reporting of gestational age - a variable used to calculate PTB rates.

The percentage of unregistered births (i.e., births not included in the live birth database) in Toronto increased from 1.1 % in 1996 to 3.2 % in 1997. In addition, there was a higher percentage of unregistered births among teen mothers (9.7%) and LBW births (4.8%). The introduction of a municipal fee for birth registration for parents in 1996-97 (currently $27.50) may be a contributing factor to the increase in unregistered births. These data quality issues have compromised the accuracy of Toronto, Ontario, and Canadian LBW data (14). More detailed information regarding these data quality issues can be found in Appendix 2.

In order to address these data quality issues, TPH is leading a partnership of Public Health Units in the GTA and the Central East Health Information Partnership (CEHIP). CEHIP is a

consortium of District Health Councils, Boards of Health and Universities in Central East Ontario with a focus on improving the quality, relevance and accessibility of population health data. The partners have been working with the GTA Child Health Network to implement the Niday Perinatal Database for the GTA. This database has been developed building on the experience of the Perinatal Partnership Program of Eastern and Southeastern Ontario (PPPESO), which successfully implemented the Niday database in 1997. The database is named after Patricia Niday, former Executive Director of the PPPESO, who was instrumental in establishing the initial database.

It is anticipated that data from the Niday Perinatal Database for the GTA will provide real time data, including maternal risk factors related to LBW, and will be available for local planning purposes by February, 2005. TPH leadership and involvement in this program was made possible through 100% funding from the Ministry of Health and Long-Term Care's Early Child Development Initiative (ECDI) in 2002 and 2003. However, this funding was not extended and is no longer available. Responsibility for the ECDI has been transferred to the new Ministry of Children and Youth Services. Although the Niday Perinatal Database for the GTA will provide timely, quality LBW data for Toronto it is still imperative that the ORG database contain high quality birth data, including LBW data, in order to enable meaningful comparisons between Toronto and the rest of Ontario and Canada. Hence, the ORG must clarify their plan to improve the quality, timeliness, and completeness of live birth data and how this plan might relate to the development of the Niday Perinatal Database.

CEHIP, having demonstrated an interest in quality assurance of live birth databases, is the logical choice for supporting this project. They have not only been actively involved in addressing data quality issues, but will be able to provide benefit to all of their public health partners and by their membership in the larger Health Intelligence program, to all public health units in Ontario.

TPH will continue to monitor these data quality issues and develop a strategy for tracking and reporting LBW trends and disparities.

ii) Obtaining a more complete understanding of factors contributing to LBW in Toronto

As indicated earlier in this report, factors responsible for the geographic disparities found in LBW rates in Toronto are not yet completely understood. TPH data analysis has identified disparity in singleton LBW rates by neighbourhood income, mother's country of birth, and mothers' age. Despite years of investigations exploring the impact of racial/ethnic and social differences on pregnancy outcomes, the exact mechanism of action remains unclear. There is likely an interplay of factors such as socioeconomic status, nutritional deficiencies, abuse/ violence, stress, social support, lifestyle behaviours, unplanned pregnancies, and prenatal health (3). There is clearly a need for further research in this area, including the identification of relevant modifiable factors and effective interventions. Given the diversity of Toronto, TPH can play a leadership role in advocating for and participating in research related to disparities in LBW.

Currently, TPH has limited data on the prevalence of specific modifiable and non-modifiable risk factors among pregnant women in Toronto. The Niday Perinatal Database for the GTA collects information on: previous preterm births, previous term births, multiple gestation, completed

weeks of gestation, and smoking. Expansion of variables collected in this database to include additional modifiable and non-modifiable factors related to LBW (such as mother's country of birth, marital status, socio-economic status, exposure to ETS, alcohol use, cocaine use, violence/ abuse, antenatal care, infection, prepregnancy weight, and weight gain during pregnancy) could assist in identifying the prevalence of modifiable risk factors within Toronto as well as increasing understanding of the interaction among selected risk factors.

Most of the peer-reviewed published data suggest there is a relationship between periodontal infections in pregnant women and the risk of adverse pregnancy outcomes. The association is supported by epidemiological data, experimental animal studies, and documentation of responses to periodontal bacteria (i.e. germs in the gums) for both mother and unborn child. If ongoing studies show that treatment of periodontal infections substantially reduces the risk of adverse pregnancy outcomes, then periodontal therapy should be considered as a necessary part of prenatal care.

Notwithstanding, TPH should advocate for dental services for low-income, high-risk pregnant women in order to improve their general health and well being and so improve the health of their babies.

Conclusions:

LBW is a significant health issue for Toronto. Toronto has higher LBW rates than the rest of Ontario and wide geographical disparities within the city.

The high burden of LBW within certain areas of the City as well as the difference in rates across areas indicates that some populations are much healthier than others.

The significant health consequences of LBW for infants and its long-term impacts on adult health and well being, as well as the preventable nature of a number of associated contributing factors, indicate that LBW is a major health issue for Toronto.

A multi-pronged approach to the prevention of LBW is required. TPH currently provides a range of programming directed towards decreasing the rate of LBW in the City overall as well as decreasing disparities in rates of LBW among Toronto subpopulations. However, available data are currently incomplete and inaccurate and not made available to TPH in a timely manner. Having access to complete and accurate birth data is essential for planning strategies to reduce LBW in Toronto. There is also a need for additional research to better identify pathways to LBW and to inform the development of effective preventive interventions.

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List of Attachments:

Appendix 1: Shah, P. & Ohlsson, A. Literature review of low birth weight, including small for gestational age and preterm birth. Executive summary. 2002

Appendix 2: Health Information, Toronto Public Health (2002). Health Status News, Issue 1-2, June 2002.

References:

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Appendix 1

Executive Summary
Literature review of low birth weight, including small for gestational age and preterm birth
2002

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Every child has the right to be wanted, well born and registered as an individual at birth.

Objectives

The objectives of this review were to critically appraise the available evidence from published systematic reviews, meta-analyses, narrative reviews and in the absence of reviews original studies to:

- Identify the determinants of preterm/small for gestational age (SGA)/low birth weight (LBW)/intrauterine growth restricted (IUGR) births and
- Ascertain the effectiveness/efficacy of interventions to prevent preterm/SGA/LBW/IUGR births

This review will help to guide Toronto Public Health initiatives to address the issue of preterm/SGA/LBW/IUGR births

Background

Preterm and LBW (including IUGR) births constitute a major health problem worldwide including Canada.

In the year 1997 LBW rates among all live births in Canada, Ontario and Toronto were 5.8, 5.9 and 6.6% respectively. However, results of a study by the Central East Health Information Partnership estimate that in 1997, 2.3% of births to Ontario residents and 3.2% of births to Toronto residents were not included in the official Ontario vital statistics data.

In 1997 the preterm birth rate for Canada (excluding Ontario) was 7.1%.

Data Accuracy

Accurate data collection and analyses are a prerequisite for the evaluation of the effectiveness of any intervention aimed at the population at risk.

Concerns about data accuracy have prevented the Canadian Perinatal Surveillance System of Health Canada from including the data from the Province of Ontario in its many peer-reviewed publications.

Preterm birth rates for Ontario and Canada (including all provinces and territories) are not included in this report due to concerns about accuracy in the reporting of gestational age in the Ontario vital statistics data.

Results of a study by the Central East Health Information Partnership show that the percentage of unregistered births (birth events not included in the official Ontario vital statistics data) in Ontario increased from less than 1% in the early 1990s to over 3% in 1998. The percentage of unregistered births is higher among births to mothers under 20 years of age and in LBW and preterm births. The rates of preterm/SGA/LBW/IUGR births are likely to be underestimated in the Province of Ontario and Toronto. The introduction of birth registration fees by some municipalities (including Toronto) in 1996/1997 appears to have negatively affected the registration process. In the event of an early neonatal death there is no incentive for parents to register the birth of their child. This could account for a serious element of bias in the reporting of vital statistics in Ontario.

Methodology

A comprehensive search strategy was carried out. Twelve electronic databases, relevant book chapters, recently published issues of five key journals and reference lists of the identified articles were searched. Explicit inclusion and exclusion criteria were developed. Selected primary data were included when review(s) were not available or studies were reported after the review. Methodological quality of included reviews and primary studies was assessed. Data were abstracted from included reviews and primary studies.

The strength of the evidence for each determinant was assessed. Determinants with proven association (information from the epidemiological studies satisfying most of the causality criteria), possible association (information from the epidemiological studies satisfying some of the causality criteria but further research is needed), and no association (information from the epidemiological studies not indicative of causal association) were identified. Potential determinants for which no information was available were also identified.

The strength of the evidence was assessed for various interventions/strategies to prevent preterm/LBW/SGA/IUGR births. Interventions/strategies were identified as having strong evidence of effectiveness (cumulative evidence from well designed meta-analyses or systematic reviews indicative of effectiveness), probable evidence of effectiveness (some evidence from systematic reviews or randomized controlled studies or clinical studies indicative of effectiveness), evidence that they may be effective (evidence from clinical and/or epidemiological studies of the causality for the determinant, however intervention studies are non-existent or poorly designed) or evidence that they were not effective (cumulative evidence from well designed meta-analyses or systematic reviews indicative of ineffectiveness). Interventions/strategies were identified for which there was a lack of or inadequate information.

Determinants of Preterm/LBW/SGA/IUGR Births

The determinants were evaluated individually for the purpose of simplicity and to identify the impact of each factor in this report. However, the problem of preterm/LBW/IUGR/SGA births is

multifactorial. An evaluation of interaction of various factors in the causation of adverse pregnancy outcomes was not always possible.

A. Determinants with proven association:

a. A short (<18 months) and a long (>60 months) birth interval
b. Previous history of preterm/LBW births
c. Race/ethnicity
d. Extremes of maternal age
e. Maternal malnutrition
f. Bacterial vaginosis
g. Urinary tract infection
h. HIV infection
i. Chronic stress
j. Low socioeconomic status
k. Tobacco use
l. Heavy alcohol use
m. Cocaine use
n. Passive smoking/environmental tobacco smoke exposure
o. Violence/abuse
p. Antenatal care
q. Placental factors
r. Multiple births

B. Determinants with possible association but further research is needed:

a. Maternal parity (first born)
b. Marital status (single)
c. Inadequate weight gain during pregnancy
d. Short maternal height
e. Low prepregnancy weight
f. Maternal medical/pregnancy associated conditions
g. Maternal trichomoniasis infection
h. Periodontal infection
i. Heavy caffeine use
j. Marijuana use
k. Licorice ingestion
l. Environmental pollution
m. Noise
n. Occupational hazards
o. Physically demanding work and prolonged standing at work
p. Uterine factors
q. Pharmacological factors
r. Paternal factors
s. Genetic factors

C. Determinants with no association:

a. Fetal sex
b. Maternal use of electromagnetic beds

D. Determinants for which no information is available:

a. Alternative medicine
b. Herbal medicines

Interventions/strategies to prevent preterm/LBW/SGA/IUGR births

A. Interventions/strategies with strong evidence of effectiveness:

a. Primary prevention:
   i. Smoking cessation and relapse prevention as a routine component of prenatal care, particularly interventions that include intensive counselling, multiple contacts, provision of supportive material and follow up.
   ii. Treatment of infection
   iii. Screening mothers with previous history of preterm/LBW births for infection
   iv. Promotion of balanced nutritious diet for all pregnant women. The nutritional status of all pregnant women should be assessed. Provision of nutritious food to mothers identified as having limited resources to meet the demands of pregnancy may be beneficial.

b. Tertiary Prevention:
   i. Administration of glucocorticoids to mothers with threatened preterm labour to reduce subsequent complications in the new-born infants

B. Interventions/strategies with probable evidence of effectiveness:

a. Primary prevention:
   i. Promotion of adequate weight gain during pregnancy*
   ii. Promotion of optimal nutrition during the preconceptional period*
   iii. Provision of antenatal care which provides an opportunity for individual assessment as well as diagnosis and appropriate management of maternal medical conditions
   iv. Early enrolment of pregnant adolescents in prenatal programs
   v. Home visiting and psychosocial support to pregnant adolescents
   vi. Supplementation of calcium for women at risk of developing pregnancy induced hypertension or with low dietary intake of calcium*
   vii. Provision of psychosocial support to high risk women experiencing chronic stress*

b. Tertiary Prevention:
   i. Transport of high risk women to perinatal centres for delivery and further management

* Research regarding the effectiveness of specific strategies is required

C. Interventions/strategies which may be effective:

a. Primary prevention:
   i. Reduction of exposure to noise*
   ii. Reduction of work related stress, physical exertion and prolonged standing*
   iii. Identification and responding to abuse/violence*
   iv. Supplementation of zinc and magnesium
   v. Prevention of cocaine use*
   vi. Identification of women using excessive alcohol during pregnancy and strategies to avoid heavy alcohol use*
   vii. Reduction of exposure to environmental toxins*
   viii. Legislation regarding regulation of artificial reproductive technologies*
   ix. Fish oil supplementation particularly to women with previous preterm births

* Research regarding the effectiveness of specific strategies is required.

D. Interventions/strategies which are not effective:

a. Primary prevention:
   i. Supplementation of high protein diet during pregnancy
   ii. Salt restriction
   iii. Psychosocial support for all women

b. Secondary prevention:
   i. Prenatal education regarding signs and symptoms of preterm labour
   ii. Home uterine activity monitoring
   iii. Tocolytics
   iv. Bedrest
   v. Hydration

E. Interventions/strategies for which there is a lack of/inadequate information:

a. Primary prevention:
   i. Supplementation of multivitamins, Vitamins A, B, C, D, E
   ii. Supplementation of minerals
   iii. Interventions regarding interaction of micronutrients
   iv. Nutritional advice
   v. Interventions regarding interaction between nutritional, social and psychological factors
   vi. Interventions to modify stressors

vii. Treatment of certain maternal infections
viii. Efficacy of nicotine replacement therapy for heavy smokers

b. Secondary prevention:
i. Screening methods to identify high risk women
ii. Methods of early prediction/diagnosis of preterm labour (clinical scoring system or monitoring cervical changes)
iii. Cervical cerclage
iv. Sedation

Supplementation of folic acid (conclusive evidence of reduction of neural tube defects) and iron (improvement in maternal hematological parameters) have shown benefit with regards to maternal/fetal health. Though these interventions have not reduced preterm/LBW births, they should be promoted.

Conclusions

Preterm/LBW/SGA/IUGR births constitute an enormous medical, societal and financial problem.

A concerted effort for estimating the true incidence of the issue in Toronto, identifying modifiable factors within the population of Toronto and methods for implementing interventions are needed.

There are multiple determinants of preterm/LBW/SGA/IUGR births. It is likely that there is interaction between these determinants. Therefore, the intervention programs should target multiple determinants. Practice based on the strength of evidence is of utmost importance to reduce the incidence and subsequent complications.

There are certain interventions/strategies for which effectiveness has not been proven, but causal associations are of sufficient strength to recommend intervention based on the precautionary principle (eg, promoting awareness of adverse effects of harmful substances such as cocaine, exposure to prolonged work related exertion).

Women with a previous history of preterm/LBW births are at increased risk for a subsequent preterm/LBW birth. Adequate support from the preconceptional period including monitoring for identified causes of previous adverse outcomes, adequate nutrition, pregnancy spacing, avoidance of harmful substances/strenuous working conditions/chronic stress, screening and treatment of infection, and socioeconomic support may help to reduce the risk of subsequent preterm/LBW birth.

Although beyond the scope of this paper, strategies/interventions directed towards the entire population to prevent smoking/exposure to environmental tobacco smoke, alcohol use, infection, violence/abuse, undernutrition, exposure to environmental toxins, and occupational hazards may help to reduce the risk of preterm/LBW births as well as other untoward health outcomes.

Research regarding pathways to preterm/LBW/SGA/IUGR births is ongoing. There is a need to understand the mechanisms underlying the differential effects of socioeconomic disparities within society on preterm/LBW. Stress/psychosocial/socioeconomic factors are important determinants. The understanding of the effects of stress is evolving. Stress could be a final pathway for many other determinants such as unhealthy lifestyles, abuse/violence, work related stress, prolonged physically demanding work, low levels of social support, and poor nutritional status. A combined effect due to physical demands, exposure to environmental toxins, and stress is suspected.

Further research is needed to understand the biological mechanisms and modifiable factors associated with racial/ethnic differences in rates of preterm/LBW.

Research regarding contributing factors and effective interventions to reduce the risk of preterm/LBW births to women in their late fertile age is also needed.

Secondary prevention measures for predicting preterm labour although promising, requires further research. Bedrest and maternal hydration have not been effective in treating threatened preterm labour. Educational programs to increase awareness of the signs and symptoms of preterm labour have been ineffective in reducing the incidence of preterm births. Tocolytic therapy is effective in reducing the rate of delivery within 48 hours. This allows for the administration of corticosteroids to the mother in an attempt to improve fetal lung maturity, but has not reduced the risk of preterm/LBW births or improved neonatal outcomes and has been associated with serious maternal complications. Further research is needed to identify safe interventions that prevent preterm birth or arrest preterm labour in its early stages. It is still important to implement and evaluate strategies that help all women recognize the signs of early preterm labour and respond by seeking early medical attention.

Tertiary prevention measures such as maternal transfer to a tertiary care centre for further management and administration of glucocorticoids have shown benefit in the overall outcome of preterm/LBW infants.

Appendix 2

Health Status News

Health Information, Toronto Public Health

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Live Births in Ontario: Data Quality Issues

Data on live births are used by Toronto Public Health (TPH) to report on reproductive and child health in Toronto and as an evidence base for program planning, service delivery and policy development. Indicators include birth, fertility, teen birth, low birth weight and pre-term rates. However, for these indicators to provide meaningful information the data must be accurate, complete, consistent and timely. This issue of *Health Status News* describes two data quality issues that have been identified in the live birth data and their impact on the utility of these data.

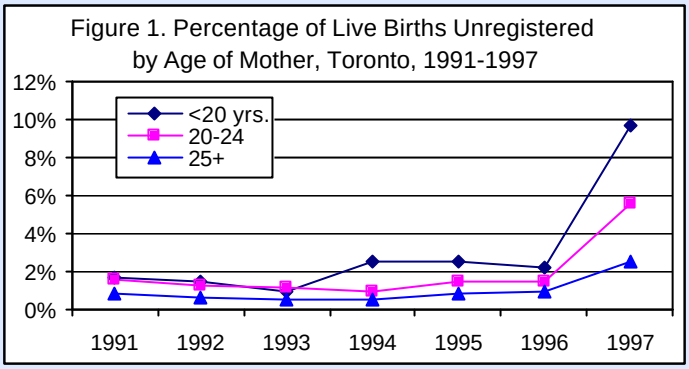
The Ontario vital statistics data are the primary source of live birth data for TPH. The data are collected under the authority of the Vital Statistics Act by the Provincial Office of the Registrar General (ORG). A live birth database is compiled on a yearly basis by the ORG and edited by Statistics Canada. The edited files are sent to the Ontario Ministry of Health and Long Term Care (MOHLTC) for distribution and analysis. The MOHLTC provides health units with access to the database through the Health Planning System (HELPS) and the Provincial Health Planning Database (PHPDB-Data Warehouse). There is currently a four year delay before annual live birth data are received by the MOHLTC. The most current data are for 1997.

Under-reporting of Live Births

For a birth to be included in the live birth database, documentation must be received from both the parents and the attending physician. If the ORG does not receive both pieces of documentation, the birth event will not be entered into the database. A study by the Central East Health Information Partnership (CEHIP)[1] analyzed the prevalence of unregistered births (births not included in the live birth database) and the association with mother's age, birth outcomes and the introduction of birth registration fees for parents in some municipalities.

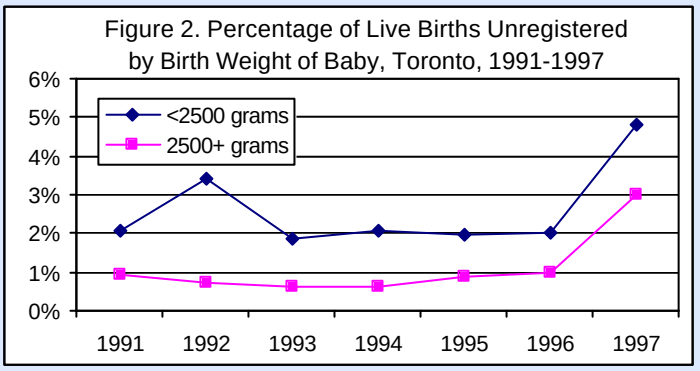
Results of the study show that the percentage of unregistered births in Ontario increased from an average of 1% between 1991 and 1996 to 2.3% in 1997. Preliminary data for 1998 show a continued increase to 3.1%. The problem is more pronounced for Toronto residents where 3.2% of live births were unregistered in 1997.

The percentage of unregistered births was higher among teen mothers and low birth weight babies. Figure 1 shows the percentage of unregistered births in Toronto by the age of the mother. In 1997, 9.7% of births to mothers under the age of 20 were unregistered.[2]



Source: Central East Health Information Partnership, Office of the Registrar General unofficial analytical file

Figure 2 shows the percentage of unregistered births in Toronto by the birth weight of the baby. In 1997, 4.8% of low birth weight babies (<2500 grams) were unregistered.[2]



Source: Central East Health Information Partnership, Office of the Registrar General unofficial analytical file

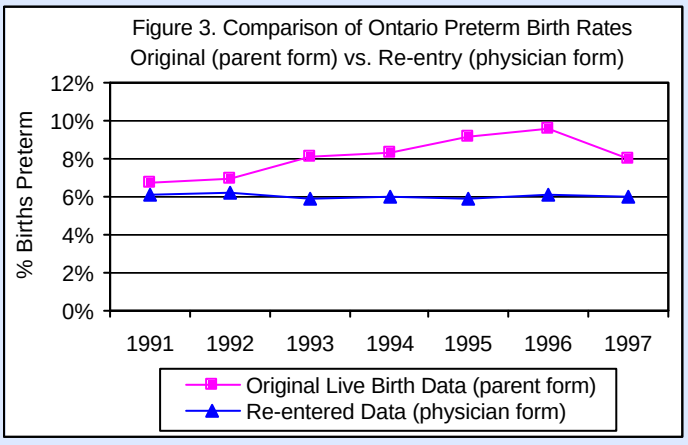
The introduction of birth registration fees for parents in Toronto in 1996/1997 (currently $27.50) appears to be associated with an increase in the number of unregistered births. The number of unregistered births is disproportionately higher among teen births and low birth weight births. Excluding unregistered births from the Ontario live birth data results in an undercount of births. Therefore birth and fertility rates based on these data, particularly rates of teen births and low birth weight births, are likely to be underestimated for Toronto and Ontario.

Reporting of Gestational Age

The live birth database compiled by the ORG is the only available source of data that includes the gestational age of the baby. Until 1990, the ORG used the Physician Notification of Birth form (PNOB) as the standard for entering gestational age. However beginning in 1991, following an office move to Thunder Bay, the ORG switched to using the parent's Statement of Live Birth form. In June of 1998, the ORG switched back to using the PNOB as the standard.

As part of the Ministry of Consumer and Business Service's plan to improve the quality of the Ontario vital statistics data, they launched the Ontario Vital Statistics Improvement Project (ONVIP). One of ONVIP's efforts to improve the quality of the 1991 to 1998 live birth data was to review the gestational ages of births with an entered age of 36 weeks or less. The physician and parent forms were compared and if the gestational age on the forms disagreed, the age recorded by the physician was entered into the database, overwriting the parent's value. Statistics Canada was contracted to analyze the re-entered data. Preliminary results of the analysis are shown in Figure 3. The graph shows a comparison of the pre-term birth rates (<37 weeks gestation) based on the re-entered data and the rates calculated using the original gestational ages from the live birth database.

Figure 3. Comparison of Ontario Preterm Birth Rates
Original (parent form) vs. Re-entry (physician form)



Source: Original: Live Birth Database, HELPS, MOHLTC
Re-entry: Office of the Registrar General, preliminary analysis by Statistics Canada

From 1991 to 1997, the pre-term birth rates based on the ORG's re-entered data range from 5.9% to 6.2%. The rates calculated using the original live birth data (values from the parent's form) range from 6.7% to 9.6%, up to 57% higher than the re-entered data. The practice of using the gestational age provided by the parents results in an overestimate of pre-term births. The parent's lack of knowledge of the gestational age in weeks for a full term baby may result in full term births being recorded as 34-36 weeks gestation and thus, classified as pre-term.

Impact of Data Quality Issues

Live birth, fertility, teen birth and low birth weight counts and rates are likely to be underestimated for Toronto and Ontario resulting from the exclusion of unregistered births from the Ontario live birth data. The underestimate is greater in 1997 when the number of unregistered births increased. *These limitations should be referenced when reporting live birth data*.

The Ontario live birth data that are currently available to health units do not contain the re-entered gestational age from the physician's form for 1991-1998. Calculations based on gestational age, such as pre-term birth rates, are likely to result in incorrect estimates. **Until corrected data are available, *pre-term/full-term birth counts and rates for the years 1991 to 1998 should not be reported for Toronto or Ontario or used for public health program planning purposes*.**

Concerns about the quality of the live birth data in the Ontario vital statistics has led to the exclusion of Ontario births (40% of all Canadian births) from reports produced by the Canadian Perinatal Surveillance System.

Next Steps

1. Public Health, along with other stakeholders, will continue to advocate for improvements in the quality and timeliness of the live birth data provided by the ORG.
2. Health Information staff are working with the GTA Child Health Network to establish an internet-based, real time perinatal database for implementation in fall, 2002.
3. Live birth data quality issues will be reviewed and addressed through the Reproductive Health Program redesign process.

1. Underreporting of live births in Ontario: 1991-1997, 2001, Central East Health Information Partnership; www.cehip.org

2. Central East Health Information Partnership, Office of the Registrar General unofficial analytical file

Health Status News is an ongoing series of information updates that summarize new data and events related to community health status in Toronto.

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Recent Health Information Reports:

- Health Status News, May 2002, On the Horizon: Arrival of New Health Status Data
- Toronto's Health Status: A Profile of Public Health in 2001
- Toronto's Health Status: A Profile of Cancer, 2000
- Data to support the Nutrition Services Redesign, March 2002