

Increasing Incidence of Infants with Low Birth Weight in Oman

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ABSTRACT: This review article provides an overview of the levels, trends and some possible explanations for the increasing rate of low birth weight (LBW) infants in Oman. LBW data from national health surveys in Oman, and published reports from Oman's Ministry of Health and the World Health Organization were collected and assessed between January and August 2014. Oman's LBW rate has been increasing since the 1980s. It was approximately 4% in 1980 and had nearly doubled (8.1%) by 2000. Since then, it has shown a slow but steady rise, reaching 10% in recent times. High rates of consanguinity, premature births, number of increased pregnancies at an older maternal age and changing lifestyles are some important factors related to the increasing rate of LBW in Oman. The underlying causes of this increase need to be understood and addressed in obstetric policies and practices in order to reduce the rate of LBW in Oman.

Keywords: Low Birth Weight; Premature Birth; Infant Mortality; Consanguinity; Oman.

الملخص: يعرض هذا المقال مراجعة عامة عن المستويات والاتجاهات وبعض التفسيرات المحتملة لتزايد انخفاض وزن المواليد في سلطنة عمان. تم جمع وتحليل بيانات نقص وزن المواليد من المسح الصحي الوطني، والتقارير التي نشرت لوزارة الصحة في عمان ومنظمة الصحة العالمية في الفترة من يناير إلى أغسطس 2014 لقد ازداد تناقص وزن المواليد في سلطنة عمان منذ 1980. فقد كان ما يقرب من 4% في عام 1980 وتضاعف تقريبا (8.1%) بحلول عام 2000. ومنذ ذلك الحين تبين ارتفاع بطيء ولكن ثابت وبلغ 10% في الأونة الأخيرة. ان ارتفاع معدلات زواج الأقارب، الولادة المبكرة، وتزايد معدلات الولادة في الأعمار المتقدمة وأسلوب الحياة المتغير هي بعض العوامل المهمة المتعلقة بتزايد معدل نقص الوزن عند المواليد في سلطنة عمان. لابد من فهم هذه الظاهرة لتوجيه سياسات وممارسات التوليد لخفض معدل نقصان وزن المواليد في سلطنة عمان.

مفتاح الكلمات: انخفاض وزن المواليد؛ الولادة المبكرة؛ معدل وفيات الرضع؛ زواج الأقارب؛ عمان.

LOW BIRTH WEIGHT (LBW) IS DEFINED BY the World Health Organization (WHO) as a birth weight of less than 2.5 kg.¹ It is considered an important indicator of neonatal (under one month of age) and infant (under one year of age) morbidity and mortality, as well as a predictor of a child's physical, emotional, psychological and educational development.¹⁻⁴ Extensive research confirms that LBW children are at greater risk of cognitive and school performance problems than their normal birth weight peers.^{5,6}

Epidemiological studies have shown that LBW babies are 20 times more likely to die than normal weight babies.^{2,3,7} LBW has been linked to many adverse health outcomes in early and later life, including delays in cognitive and behavioural development,⁸ growth retardation and neurological problems in childhood,² and chronic diseases such as hypertension, stroke, coronary heart disease (and related disorders) and diabetes in adulthood.^{9,10}

As LBW is considered an important indicator of public health and a predictor of the future population's health, many world organisations, including the WHO and the United Nations International Children's Emergency Fund (UNICEF), have adopted different strategies to reduce the incidence of LBW. Reducing LBW rates by at least one-third is one of the major goals for the current decade in the 'World Fit for Children,' section of the Declaration and Plan of Action adopted at the United Nations General Assembly Special Session on Children in 2002.¹¹ The reduction of LBW rates is also related to the United Nation's Millennium Development Goal (MDG) for reducing child mortality.¹² LBW is therefore an important indicator for monitoring progress towards these internationally agreed-upon goals and thus given high priority by national governments and the international community.

LBW is either the result of prematurity (birth at under 37 weeks of gestation) or intrauterine growth restriction. The duration of gestation and fetal growth

are affected by many factors related to the infant, the mother, the physical environment and genetics, and play an important role in determining an infant's birth weight and future health.⁷ Risk factors for LBW include, among others, maternal age; risky health behaviours; insufficient antenatal care; psychosocial stress; a low maternal body mass index; disease; poor nutrition, diet and/or lifestyle choices during pregnancy; the socioeconomic characteristics and parity of the mother; the gender of the baby; genetic factors, and environmental pollution.⁷ Certain genetic conditions and congenital anomalies are also related to a higher incidence of LBW.¹³

According to the report of a joint study from UNICEF and the WHO, which investigated global, regional and country-specific LBW rates in 2000, more than 20 million infants around the world (16% of total births) were born with LBW and approximately 95% of these infants were born in developing countries.⁷ However, these numbers are mainly based on births that occurred in healthcare facilities and have been recorded officially.⁷ As more than half the number of babies born in the developing world are not weighed, since they are born outside health facilities, the actual number could be double this official statistic.⁷ The aforementioned study showed that the rate of LBW in developing countries (17%) was more than double the rate in developed regions (7%).⁷ Half of these LBW neonates were born in south central Asia, where more than 27% of all infants were considered to have a LBW. Sub-Saharan Africa had the second highest rate of LBW babies (15%). Central and South America and Oceania had lower LBW rates (10%), while the Caribbean had a similar rate (14%) to that of sub-Saharan Africa.⁷

Oman is passing through a crucial phase of health transition and facing the burden of morbidities, which could be considered a specific characteristic of newly developing countries. Oman has made impressive gains in the achievement of key MDGs, and several diseases have been eliminated from the country.¹⁴ Almost all health indicators have improved over the past four decades and this achievement has been widely recognised and acclaimed by various international organisations, including the WHO.¹⁵ Despite improved health statistics, recent concern has focused on childhood health indicators. In particular, LBW and infant and under-five mortality rates (U5MRs) have been examined given their static or increasing trends; these have been indicated by recent health statistics released by Oman's Ministry of Health (MOH) in 2012.¹⁶ These statistics show that LBW was the second leading cause of early neonatal mortality, the third leading cause of mortality among infants

with congenital anomalies and the leading cause of early childhood mortality.¹⁶ Thus, LBW and childhood mortality have emerged as new challenges for the improvement of child health in Oman.

The current review article provides an overview of the levels and trends of LBW in Oman and speculates on the possible reasons for recent trends in LBW. The findings presented here may have important policy implications for the improvement of adverse pregnancy outcomes in Oman.

Sources of Oman's Low Birth Weight Information

Since its first five-year health plan was instituted in 1976, Oman has developed a well-organised health information system under the MOH that can be used to monitor changes in major health indicators. Thus, the data for the current study were obtained from reports of the Oman National Health Information Statistics (NHIS), which cover the period of 1970 to 2012; these data were included in the MOH's 2012 Annual Health Report.¹⁶ Data were also extracted from other national-level health surveys such as the 2000 Oman National Health Survey (ONHS) and the 2008 Oman World Health Survey (OWHS).^{17,18} The only limitation in using the rich array of health service statistics of the NHIS is uncertainty about the coverage of these services. Additionally, certain population characteristics are not well represented by these data.¹⁹ An additional limitation of the use of secondary information is that it lacks analysis of risk factors across the full spectrum of socioeconomic levels and behavioural factors.

Low Birth Weight and Childhood Mortality in Oman

Table 1 and Figure 1 present the levels and trends of LBW in Oman since 1980. Data from the NHIS reveal that 5,897 (9.5%) out of the 62,065 live births that occurred in 2012 were LBW infants.¹⁶ Among those with LBW, 745 (1.2%) had a very low birth weight (VLBW) which is a birth weight of <1,500 g. Thus, VLBW rates infants constituted 13% of the total cases of LBW in Oman. There is an increasing trend in both LBW and VLBW in Oman.¹⁶ According to the NHIS's routine data, the prevalence of LBW was approximately 4.2% in 1980, doubling to 8.1% in 2000. Since then the prevalence has shown a slow but steady increase, reaching 9.5% in 2012 [Figure 1].¹⁶

Table 1 also presents a comparative analysis of the two estimates of the incidence of LBW and VLBW

Table 1: Birth weights in Oman from 1980–2012 by category, survey and year

Category*	Live births per survey and year, %				P values†	
	1980 NHIS	2000 ONHS	2000 NHIS	2012 NHIS	2000 ONHS versus 2000 NHIS	2000 NHIS versus 2012 NHIS
NBW	95.8	90.9	91.9	90.5	t = 1.08; P > 0.250	t = 7.79; P < 0.001
LBW	4.2	9.1	8.1	9.5	t = 1.08; P > 0.250	t = 7.79; P < 0.001
MLBW	N/A	8.4	7.3	8.3	t = 1.23; P > 0.200	t = 5.87; P < 0.001
VLBW	N/A	0.7	0.8	1.2	t = 0.37; P > 0.500	t = 7.30; P < 0.001
Live births, n	N/A	977	40,382	62,065	-	-

NHIS = National Health Information Statistics survey;¹⁶ ONHS = Oman National Health Survey;^{17,18} NBW = normal birth weight; LBW = low birth weight; MLBW = moderately low birth weight; VLBW = very low birth weight; N/A = not available.

*Infants of $\geq 2,500$ g were considered of NBW, < 2,500 g of LBW, 1,500–2,499 g of MLBW and < 1,500 g of VLBW.

†P values are based on Student's t-test, comparing two proportions.

obtained from the 2000 ONHS data and the 2000 NHIS routine data. The two estimates appeared to be consistent and very close in agreement. However, the 2000 ONHS indicated a slightly higher estimate of LBW (9.1%) than the estimate obtained from the official data of the 2000 NHIS (8.1%) for the same period.^{16,17} However, the difference was not statistically significant (t = 1.08; P > 0.250). The results thus validate the estimates of health indicators obtained from the NHIS in Oman.¹⁶

The rate of infant mortality (i.e. death during the first year of life) dropped from 118 per 1,000 live births in 1970 to 9.5 per 1,000 live births in 2012, a decline of 92% within four decades [Figure 1]. Mortality in children under five years dropped by 94% (from 181 to 11.5 per 1,000 live births) in the same period.¹⁶ The data indicate that more than 80% of under-five mortalities have been due to infant mortality in recent decades; in fact, since 2000, the infant and U5MRs in Oman have remained almost unchanged, despite continued efforts at reducing childhood mortality.¹⁶ This might have some relation with the increased incidence of LBW.

Low Birth Weight in Other Countries

The incidence of LBW (~9%) in Oman was found to be higher than that in many countries with similar socioeconomic and cultural backgrounds. According to the joint UNICEF and WHO study of global, regional and country estimates of LBW in 2000, Oman had a higher incidence of LBW than Lebanon (6%), Syria (6%), Algeria (7%), Kuwait (7%), Libya (7%), Tunisia (7%) and Bahrain (8%).⁷ However, the incidence was lower than Jordan (10%), Qatar (10%), Morocco (11%), Saudi Arabia (11%), Egypt (12%), Nigeria (14%), Sudan (31%) and Yemen (32%) [Figure 2].⁷

Regional Variation in Low Birth Weight Rates in Oman

There are significant regional variations in LBW in Oman [Table 2]. According to the 2012 NHIS data, the Al-Dakhiliyah region had the highest incidence of LBW (11.12%) followed by Muscat (9.95%), north Ash

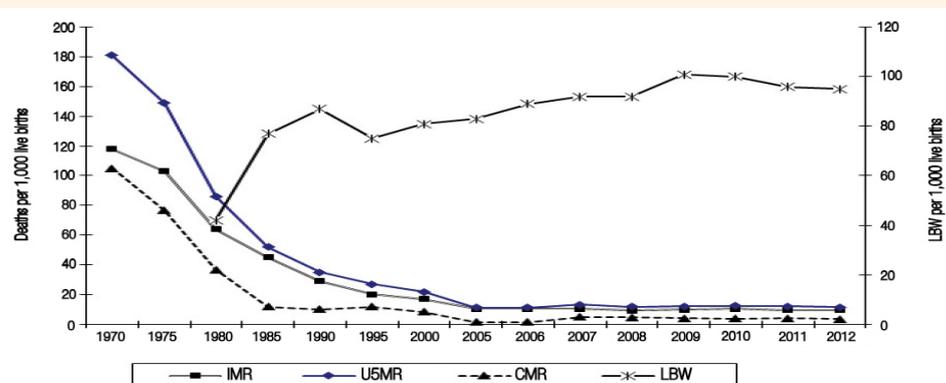


Figure 1: Levels and trends in LBW, infant mortality, child mortality and under-five mortality rates in Oman from 1970–2012.¹⁶

IMR = infant mortality rate; U5MR = under-five mortality rate; CMR = child mortality rate; LBW = low birth weight.

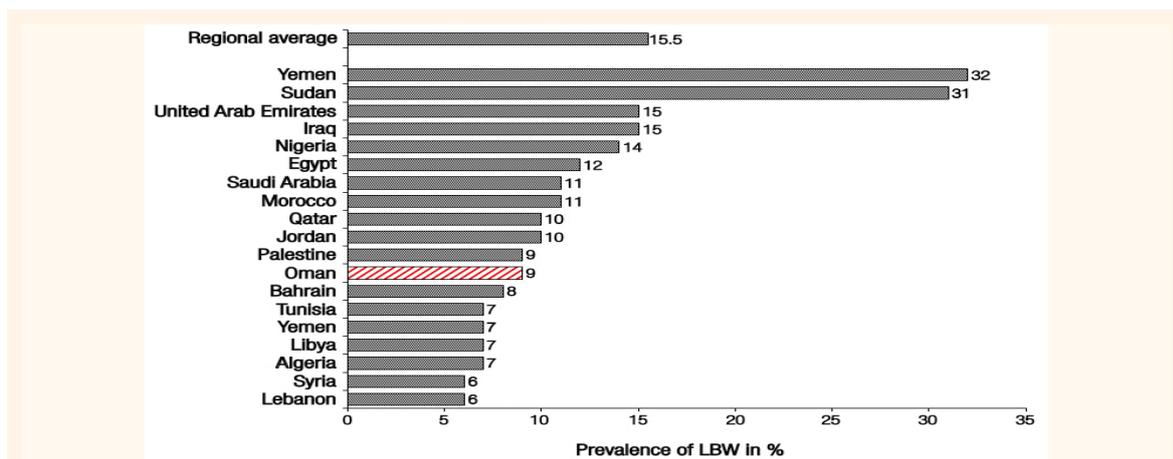


Figure 2: Prevalence of LBW in selected countries.⁷
 LBW = low birth weight.

Sharqiyah (9.90%) and Al-Batinah (9.57%). The Al-Wusta region had the lowest incidence (2.34%).¹⁶ This regional comparison, however, may be misleading, particularly for the Muscat region, because many of the women who deliver in hospitals and clinics in Muscat live elsewhere. As Muscat is Oman’s capital city and has specialised hospitals and clinics, women from all over the country, and especially those with complicated pregnancies, come to Muscat to use the delivery facilities. As a result, the declared rate of LBW is likely to be higher in Muscat, despite the improved health and socioeconomic conditions of the population. In this regard, national-level household survey or census data may provide a more accurate comparative picture of regional variations. Thus, in this study, data from the 2000 ONHS were used to analyse regional variations in LBW in Oman. According to the 2000 ONHS data, the highest LBW rate was observed in Al-Batinah (~12%) followed by Ad-Dhahirah and north Ash Sharqiyah (11% each). The lowest level of LBW was observed in Muscat (5.5%).¹⁷

Epidemiological Transition

As a newly developed country, Oman is facing a double burden of morbidity. It carries the burden of the present epidemiological changes as well as the health problems that result from unhealthy lifestyles typical in developed countries. Recent economic development and modernisation have led to changing nutritional habits and a decrease in habitual physical exercise. As a result, the country is passing through an epidemiological transition from communicable to non-communicable diseases.¹⁸ The main diseases or complications resulting from these changes include obesity, cardiac and coronary diseases, hypertension, diabetes, infectious diseases, cancers, chronic kidney

diseases, stroke and geriatric diseases.¹⁶ Many of these health problems manifest in women and lead to preterm births and LBW babies.

Underlying Causes of Increased Low Birth Weight in Oman

Globally, more than one in 10 infants are born preterm and 70% of them are born with a LBW; both of these rates are increasing.²⁰ While Oman is not exempt from the increase in LBW babies, there is no precise national estimate of preterm births due to a lack of routine data collection through the NHIS or any other health survey on prematurity. A recent hospital-based study reported that about 10% of births in Oman are

Table 2: Regional variations in low birth weight rates in Oman*

Region	Rate per year	
	2012	2000
Muscat	9.95	5.5
Dhofar	7.79	6.0
Al-Dakhiliyah	11.12	10.4
Ash Sharqiyah (north)	9.90	10.8
Ash Sharqiyah (south)	7.86	8.8
Al-Batinah (north)	9.57	11.6
Al-Batinah (south)	8.88	12.2
Ad-Dhahirah	9.48	11.0
Al-Wusta	2.34	6.7
Total	9.45	9.1

*Data from the National Health Information Statistics and Oman National Health Survey.^{16,17}

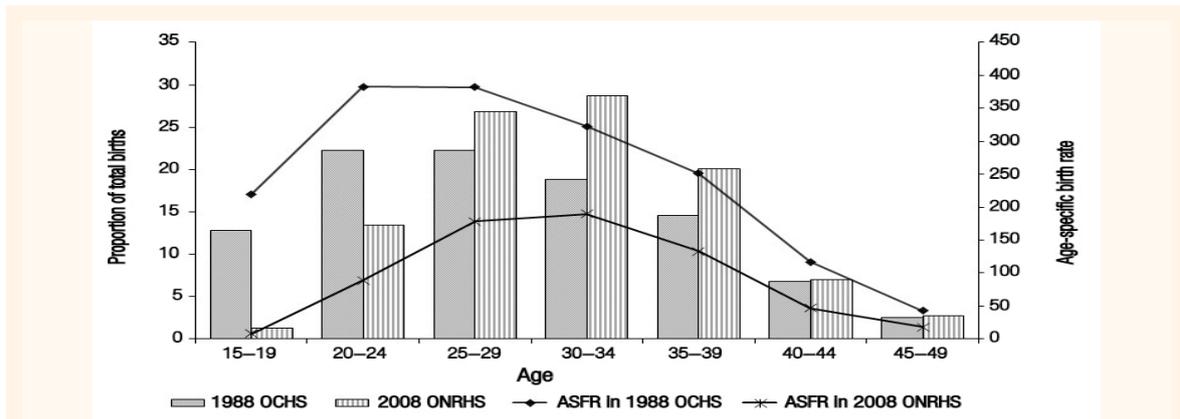


Figure 3: Proportion of total births and age-specific birth rate per woman in 1988 and 2008 in Oman.^{17,18,32}
 OCHS = Oman Child Health Survey; ONRHS = Oman National Reproductive Health Survey; ASFR = age-specific fertility rate.

preterm births.²¹ This rate is quite high and might play an important role in increasing the LBW rate in Oman, as most preterm infants have a LBW.

Like other Arab countries, consanguineous marriages, or marriages between close kin or blood relations, are a deeply-rooted cultural trend in Oman, with more than half of all marriages considered consanguineous (52%).²² The long tradition of consanguineous marriages in Omani society may have important ramifications on the prevalence of genetic diseases, congenital abnormalities, high preterm birth rates and adverse pregnancy outcomes, including LBW. The effects of consanguinity on human reproduction and the health of the resulting offspring are well-documented.^{23,24} Recent hospital- and clinic-based studies in Oman have demonstrated a higher risk of congenital disorders and ill health among the offspring of consanguineous couples, but these studies did not examine the link between consanguinity and LBW.^{25,26} More in-depth research is needed to identify the causal link between consanguinity and LBW.

Many preterm births happen spontaneously, while others result from early induction of labour or Caesarean section (CS), whether for medical or non-medical reasons. Although the CS was introduced in clinical practice as a lifesaving procedure both for the mother and baby, its use follows the healthcare inequity pattern of the world: underuse in low-income settings and adequate or even unnecessary use in middle and high-income settings.^{27,28} The WHO stated that CS rates higher than 10–15% are an unnecessary economic burden.²⁹ According to NHIS data, the rate of CS deliveries has increased from 6.6% in 1995 to 11.6% in 2000, and has further increased to 17.5% in 2012.¹⁶

In Oman, with couples marrying later in life and the preference for a large family size, the childbearing age is increasing, and more women are choosing to have children at the age of 35 years and above to achieve

their desired family size.^{30,31} For example, the singulate mean age at marriage for females in Oman has increased from 19.2 years in 1988 to 26.8 years in 2008, and the corresponding total fertility rate has declined dramatically from 8.6 births per woman in 1988 to 3.3 births per woman in 2008.^{17,18,28} Concurrently, the proportion of births occurring to women aged 35–49 years has increased from 23.9% in 1988 to 29.8% in 2008; an increase of 25% over a 20-year period [Figure 3].^{18,32} Consequently, fertility has declined in younger women, shifting instead towards older women. The age distribution of fertility shows a broad, flat top, indicating a continuation of fertility at a higher rate until the age of 35–39 years.¹⁸ As mothers older than 35 are at greater risk for certain complications during pregnancy that may require a CS, such births are likely to continue to increase, simultaneously contributing to an increase in LBW.

Various reasons have been ascribed to explain the increased risk of CS deliveries among older women.^{33–36} It has also been observed that advanced maternal age alone may be a factor influencing both mothers' and physicians' decisions to have a CS.^{35,36} In many cases, physicians' concerns might prompt a CS delivery to avoid the risk of adverse pregnancy outcomes. This rising trend in CS delivery and its possible association with the rising LBW in Oman needs special attention in healthcare planning.

With recent advances in modern obstetric and neonatal care and technological developments in Oman, high-risk neonates have a greater chance of survival in the newly formed intensive care units. Because of this, an increasing number of more and more small and LBW babies appear to be reported as live births. This may also cause an increase in the rate of LBW infants and, subsequently, an increased rate of long-term neurological problems as these infants are at high risk of health and developmental problems.¹⁶

As a result, a number of them do not survive through early childhood. Thus, the rates of infant mortality and U5MRs are not declining to the same extent that they have in the past. To some extent, the levelling off of decreasing infant and childhood mortality rates in Oman could be attributed to the increasing rate of LBW babies.

Policy Implications

Oman has a moderately high incidence of LBW infants compared to other middle-income and high-income countries and the rate is increasing. As LBW is one of the most important biomarkers of the health, survival and future development of newborn babies, it is important to identify the risk factors of LBW in Oman and its ramifications for the educational development of children so that appropriate measures can be taken for the improvement of health, survival and development of infants. Since many of these children are now attending school, it is important to investigate how they are coping academically. The poor outcomes of LBW children have economic and social consequences that go beyond immediate healthcare and special education costs as they may have much longer-term effects.

Neonatal and infant mortality rates can be greatly reduced by improving both maternal care of mothers during pregnancy and childbirth, as well as both neonates and infant care of LBW infants. Experience from developed countries has clearly shown that appropriate care of LBW infants, including their feeding, temperature maintenance, and early detection and treatment of infections and complications, including respiratory distress syndrome, can substantially reduce mortality.^{20,37}

Since preterm birth, whether it is spontaneous or provider-initiated, is one of the important causes of LBW, its prevention or reduction could be one of the best ways to prevent babies being born with LBW. Considering the moderately high incidence of preterm births in Oman, appropriate policies and programmes need to be undertaken to reduce this phenomenon. For spontaneous preterm births, the underlying causes need to be understood and addressed, while in the case of provider-initiated preterm births, both the underlying conditions, such as pre-eclampsia, and obstetric policies and practices need to be assessed and addressed. Prenatal care is a key factor in preventing preterm births and LBW babies. At prenatal visits, the health of both the mother and the fetus can be checked. Because maternal nutrition and weight gain are linked with fetal weight gain and birth weight, eating a healthy diet and gaining the proper amount of

weight in pregnancy are essential. Mothers need to be advised to maintain a healthy lifestyle and avoid habits that can contribute to poor fetal growth and other obstetric complications.

Conclusion

This paper provides an overview of the levels, trends, possible explanations and the policy implications of Oman's increasing LBW rate. Oman is passing through an epidemiological transition. Despite a dramatic improvement in the health and survival of individuals, childhood mortality and LBW have emerged as major national public health issues. The NHIS of the MOH indicate that the national infant mortality rate has remained at an almost unchanged level of 10 per 1,000 live births since 2000 while the LBW rate has shown an increasing trend since the 1980s. The incidence of LBW in Oman is higher than observed in many other Arab countries. High rates of consanguinity, premature births, the increased number of pregnancies at an older age, improved medical technologies and changing lifestyles are some important factors related to the increasing rate of LBW in this country. The underlying causes of their LBW increase in need to be understood and addressed in obstetric policies and practices in order to reduce this rate in Oman.

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