



RESEARCH ARTICLE

EPIDEMIOLOGICAL ANALYSIS OF FERTILE WOMEN MORTALITY AT HOSPITALS BELONGING TO THE HEALTH SYSTEM OF BUENOS AIRES CITY ARGENTINE

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ABSTRACT

In developing countries, women at reproductive ages neither receive the appropriate assistance from the Health Systems and in some countries nor during pregnancy. One of the most important points, is the lack of reliable information about the origin and number and cause of death that would allow to design strategies to their decrease. There were analyzed the Statistical Informs of Hospital Admission of all the female death into reproductive age defined as between 10 and 49 years old. The analysis of the informs was classified and lead to the investigation of the clinical record of the patient. In this way we tried to avoid the under report of female death in Services no related with Obstetrics & Gynecology. Evidently, is clear that the method to search for the rate and cause of deceased female in reproductive ages should be revised. On other way and thinking that the rate is 1/10.000 obviously the proposals to control female mortality should be different that if we assume that the real rate is 14/10.000. We think that is urgent that the Buenos Aires city Government focus about a project to build a Permanent Commission to detection and vigilance of mortality of women in reproductive age, in the same way it is doing in developed world.

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INTRODUCTION

In developing countries, women at reproductive ages neither receive the appropriate assistance from the Health Systems and in some countries nor during pregnancy. Albuquerque *et al.* (1998) reviewed the causes of death of women at reproductive age (between 10 and 49 years old) from defunct certificates at Recife city (Brasil) during 1992 and 1993. To avoid confusion, when they considered necessary, the clinical record and the autopsy report were checked, they talked with the physician on charge and in some cases they went to the patients homes. The authors identified 1013 deaths and the main causes were cancer, cardiovascular diseases and external causes. The complications associated to pregnancy, delivery and puerperium occupied the ninth place. Sala *et al.* (1998), reviewed female death because gynecological cancer. Generally, professionals and administrative workers presented an increased risk of death by endometrial and ovarian cancer, whereas the mortality because cervical cancer was increased in hand workers, farm workers, maid servants and nurses and health assistants. The associations with some works, involve chemical and metal expositions, such as the association among cervical cancer and to work in printing houses. This relation merit a more deep analysis.

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Wessel *et al.* (1999) performed an investigation by verbal autopsy. They could get an attributable cause in the 77% of cases. The more frequent causes of death were circulatory diseases, external causes, obstetrical causes, infectious diseases and cancer. It was estimated that 3 from 4 deaths had been avoidable with local resources. This allowed to conclude that becoming easier the access to the health systems should take to a decrease in the rate of death of these women. Hadad *et al.* (2000) informed that in women younger than 35 years old, the main cause of death was infection by AIDS virus, but in women older than 35 years old predominate the vascular diseases and cancer. The authors coincide that most of deaths could have been avoided with a better access to the health system. The same author (Haddad *et al.*, 2000) did a new revision of the vascular diseases as a death cause. The most frequent vascular diseases were cerebral strokes, ischemic hearth disease, other hearth illness, arterial hypertension and rheumatic hearth disease. This findings reinforce the concept of the need to implement a preventive policy. Recently, Clark and Belfort (2017) analyzed the present problem of maternal mortality (MM) in USA. According their study, this country present the most elevated rate of MM among developed countries. The rate in 2014 of 22/100.000 is four to five times higher than the announced in Sweden and Austria and is close to the double than in Canada. This fact in a developed country that spend an important percentage of their gross internal product in health is considered a disgrace and a human rights

crisis. Following with the reasoning of Clark & Belfort, MM is only the tip of the iceberg bellow which is the wide spectrum of maternal morbidity with all the implication and impact that this fact have about the social roll of the mother and family. One of the most important points that they mark, is the lack of reliable information about the origin and number and cause of death that would allow to design strategies to their decrease. Another previous study from Clark (2014) analyzed 81 maternal deaths in which the cause of death was compared between the cause in the clinical record and the cause founded by an expert committee, finding a coincidence of 52%. Clark quote that the fact to rely in administrative information could take toward an under register of up 82%. This points of view expressed by the authors, have been suspected for us as interference factors when we analyzed the MM statistics of our city and we decided to perform the present study, where we compare the information from the clinical records, the Service from which the patient was discharged and the general information from The Health Ministry of our city (administrative information according to Clark & Belfort definition) and perform the comparisons to determine the level of coincidence with the information obtained directly from the clinical record of the death patient.

### Objective

To analyze the main causes related with the death of female patients into reproductive age and their frequency. To compare the rate obtained by the systematic revision of the clinical records of the dead patients against the rate produced officially (administrative information).

### MATERIALS AND METHODS

There were analyzed the Statistical Informs of Hospital Admission of all the female death into reproductive age defined as between 10 and 49 years old. The analysis of the nforms was classified and lead to the investigation of the clinical record of the patient. In this way we tried to avoid the under report of female death in Services no related with Obstetrics & Gynecology. The sample is made up with the 2.312 female deaths of women between 10 and 49 years old in the 19 Hospitals belonging to The Health System of the Buenos Aires City (Argentina). There were included in the study 1808 cases chosen at random during the years 1992-1994-1996-1998. The cases were analyzed by death attributable cause, the age of the patients, the place where they lived, the Hospital from which they were discharged and the Service where the death happen. The cases of MM were analyzed according the attributable cause, the relationship between MM and female death and for every year analyzed and the incidence of abortion as a direct cause of MM in general and year by year. Finally, we did a comparison among the Official rates and the ones obtained by the present study.

The definitions we used for MM are the same that were approved for The National Program of Health Statistics from The Health Ministry of the City in 1994:

- **Maternal Mortality:** Is the death of a woman while she is pregnant or during the 42 days after delivery, independently of the length and place of the pregnancy but not for accidental or incidental causes.
- **Direct causes:** Are those related with obstetrical complications during pregnancy, labor, delivery and puerperium, from interventions, omissions, incorrect

treatment or a chain of events originated from the any of the mentioned circumstances.

- **Indirect causes:** are those that happen as a consequence of a disease present before pregnancy or a disease that impair during pregnancy, not due to obstetrical direct cause but impaired for the physiological changes of pregnancy.

### RESULTS

The Table 1, show us the number of birth and the way of delivery from all of birth assisted at the Buenos Aires Public Hospitals between 1995 and 1999. We can observe a decreasing tendency in the number of birth assisted by the System Hospitals from 32.414 birth assisted during 1995 to 26.796 birth during 1.999. Also, it could be seen an increase of the rate of cesarean sections (CS) from 19.8% during 1995 to 22.98% during 1.999. The decreasing tendency also can be seen in the rate of forceps applications from 3.68% during 1.995 to 2.71% during 1.999.

**Table 1. Way to end of pregnancy Buenos Aires City Public Hospitals System (1995-1999)**

Year	Total	% Spontaneous	% CS	% Forceps	% Others
1995	32414	75.74	19.80	3.68	0.75
1996	31548	74.89	20.93	3.07	1.09
1997	28746	73.54	22.03	3.27	1.14
1998	28133	73.04	22.44	3.15	1.36
1999	26796	72.88	22.98	2.71	1.42

Source: Hospital Statistics-Delivery-Dirección de Estadísticas para la Salud. Secretaría de Salud. Gobierno de la Ciudad de Buenos Aires. Año 1999.

The Table 2, analyzed the five most frequent causes of female death. The cause that most increased it annual rate was AIDS and by the end of the analyzed period was responsible of the 23.5% of the female death with 424 cases. The causes classified as external occupied the second place with a rate of 8.5% (154 cases), third the breast cancer with 7.6% (138 cases), fourth cervical cancer 7.1% (128 cases) and finally the MM 6.3% (113 cases). Besides, we can see that the female death has increased from 1.992 to 1.996 with an initial number of 312 cases to 573 cases during 1996 and 507 cases during 1.998.

**Table 2. Female deceased at fertil age Main causes Buenos Aires City Public Hospitals System**

Causes	Year 1992	1994	1996	1998	Total	%
AIDS	41	102	139	142	424	23.5
External	46	51	31	26	154	8.5
Breast cancer	19	27	49	43	138	7.6
Cervical cancer	21	31	41	35	128	7.1
Maternal	30	31	31	21	113	6.3
Others	157	242	291	268	959	53
Total	312	415	573	507	1808	100

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infante Juvenil. Año 1999

The Table 3, analyzed the age of deceased patients and the relation with the attributable cause. In spite of the female mortality was found in women between 15 and 49 years old, the most numerous cases were between 20 and 39 years old. In this group of ages we can find the 83.40% of deceased patients. Also, is important to take in account that 7% of death happen in the group with ages between 40 to 44 years old. The death attributed to extern causes show a similar distribution. The breast cancer was a death cause in patients between 20 and

49 years old, but it was most frequent from 35 years old, increasing up the double between 40 and 44 years old patients and increasing again after 45 years old patients. The cervical cancer appeared as a cause of female death from 20 years old, but is observed an increasing rate 5 years before the age of the breast cancer appears. It means, the high frequency of cervical cancer is observed from 30 years old, almost increase three times from 35 years old, this frequency is kept after the 40 years and increased again after 45 years old patients. AIDS was present as a death cause at all ages, but increased clearly after 20 years old until 39 years old, time by which it start to decrease. However, between 20 and 39 years old 86.8% of the death occur.

**Table 3. Percentage of Distribution of the five main causes of death in 1.808 deceased women at fertile age according the age of the patients**

Age	Maternal	Extern	Ca. breast	AIDS	Ca Cérvix
10-14	0	3.9	0	0.2	0
15-19	8.8	12.3	0	1.2	0
20-24	20.2	13.6	1.4	18.9	3.1
25-29	24.6	13.6	2.2	34.4	1.6
30-34	22.8	16.9	5.1	21.9	9.4
35-39	15.8	13.6	14.5	11.6	25.8
40-44	7	13.6	32.6	7.3	25.8
45-49	0.3	12.3	42.8	4.5	34.4
Total	6.3	8.5	7.6	23.5	7.1

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA-Departamento Materno Infanto Juvenil

The Table 4 describe the population of patients with MM according they reside or not at Buenos Aires city. We can observe that the frequency of patients who reside at the city was stable during the study period whereas the frequency of patients who not reside at the Buenos Aires city was decreasing along the study period of time.

**Table 4. Origin of the 113 MM according the studied year GCBA Hospitals**

Origin/Years	1992	1994	1996	1998
Resident	6.5%	7.5%	5.2%	6.8%
No Resident	11.2%	7.4%	5.5%	2.4%

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infanto Juvenil. Año 1999

The maternal death were after analyzed according the Hospital from which the patients were discharged (table 5). Is important to underscore that from of 113 maternal death, 33% had not been noticed such as unless of the used methodology, because the diagnosis in the death certificates and the clinical records, masked their relationship with the pregnancy. Furthermore, half of cases were not discharged from an Obstetrical Service. Table 6, analyzed the Service in which the maternal death happen. A half of death (52.2%) occurred in Gynecology & Obstetrics Services, but the other half occurred in another Services encouraging to improve the methodology to detect MM. The fact to not take in account this, would produce a 50% of under registered MM. Due to many complications of pregnancy, delivery and puerperium should be solved in Intensive Care Units (ICU), is justified that the Services of Obstetrics and ICU group together the 73.4% of MM. If we add that some pregnancies with serious diseases could have been admitted by Emergency Departments (ED) at General Hospitals, among the three Services we group together the 85.8% of cases of MM. But, even so, to not investigate in

which situation had occurred de maternal death, could produce an under register of up 14.2%.

**Table 5. Maternal Death according the discharging Hospital**

Hospital	N	%
Argerich	14	12.3
Penna	13	11.4
Fernández	12	10.5
Durand	11	9.6
Muñiz	10	8.8
Alvarez	8	7
Sardá°	7	7
Piñero	7	6.1
Santojanni°	7	6.1
Ramos Mejía	5	4.4
Pirovano	4	3.5
Quemados	4	3.5
Velez Sarsfield	4	3.5
Rivadavia	3	2.6
Oncológico	2	1.8
Zubizarreta	1	0.9
Tornú	1	0.9
Total	113	100

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infanto Juvenil. Año 1999

- Into a System with 25.000 deliveries per year, this two Hospitals assist the half of deliveries at year. By the time of the study was done, the Sardá Hospital does not have Intensive Care Unit for Adults.

**Table 6. Maternal Deceased according Medical Services**

Service	N	%
Obstet & Gynecol	59	52.2
ICU	24	21.2
ED	14	12.4
Clínic	8	7.1
Infectious	5	4.4
Surgery	2	1.8
Others	1	0.9
Total	113	100

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infanto Juvenil. Año 1999

Table 7 describe the main causes of MM. The 33.6% of deceased correspond to Direct Causes, between the most frequent was abortion (usual ilegal-take in account that in our country abortion is not allowed) with 19 cases (50%), after hemorrhages (28.9%) and then Hypertensive diseases (21.5%). Among MM from Indirect Cause (18.5%), the main cause was AIDS (57.14%) and then cancer (42.85%).

**Table 7. Death causes in the 113 maternal deceased patients**

Cause	N	%
Abortion (D)	19	50.00
AIDS (I)	12	57.14
Hemorrhage (D)	11	28.9
Cancer (I)	9	42.85
Hypertensive diseases (D)	8	21.5
Extern	6	5.3
Others	49	43.4
Total	113	100
Direct	38	33.6
Indirect	21	18.5

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infanto Juvenil. Año 1999

- (D) Direct cause.
- (I) Indirect cause.

The Table 8, allow us to observe the percentage of MM year by year from the global female mortality among patients who

reside in Buenos Aires City. This percentage have remain stable in spite of some changes like the noticeable increment of female mortality because of AIDS. The final contribution was: 6.3% of female deceased were MM (45 death from a total of 713 death).

**Table 8. MM (%) from the total female mortality of women in fertile age who reside in Buenos Aires City**

Year	All deceased	MM	%
1992	107	7	6.5
1994	173	13	7.5
1996	212	11	5.2
1998	220	14	6.4
Total	713	45	6.3

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infante Juvenil. Año 1999

This Table (8) allow besides to show us that among the resident in Buenos Aires City, the female mortality during reproductive ages have duplicate between 1992 with 107 cases and 1998 with 220 cases. In spite of, MM have remain stable when the expected would have been a decrement. Table 9 related the contribution of abortion to the rate of MM. We can see clearly that along the time analyzed, the contribution of abortion to the female mortality is increased with almost a duplication of percentages between 1996 (18.2%) and 1998 (35.7%). The final contribution is one from five maternal death occurred because abortion (22.2%).

**Table 9. Proportional contribution of abortion as a maternal mortality cause in Buenos Aires City residents**

Year	MM	Abortion	%
1992	7	1	14.3
1994	13	2	15.4
1996	11	2	18.2
1998	14	5	35.7
Total	45	10	22.2

Source: Programa de Investigación Epidemiológica de la Mortalidad de la Mujer en Edad Fértil. Secretaría de Salud. GCBA. Departamento Materno Infante Juvenil. Año 1999

Finally in table 10, we did a comparison among the official report of maternal mortality informed by the General Office of Statistics of Buenos Aires Government and the outcomes produced by the analysis of the medical records during the same period of time. May be observed an evident under register in the official information.

**Table 10. Deceases, Difference and Rate of MM by 10.000 live birth according official information and outcomes from the clinical records revision**

Year	Official*	Study**	%Difference	MMR Of.	MMR study.
1992	4	7	75	1	1.8
1994	3	13	333	0.8	3.3
1996	3	11	267	0.8	2.8
1998	1	14	1300	0.3	3.5

\*Source: Demografía Ciudad de Buenos Aires. Dirección General de Estadísticas y Censos. Diciembre 1999.

\*\*Source: Informe Estadístico de Hospitalización. Dirección de Estadísticas para la Salud. Elaboración: Departamento Materno Infante Juvenil, Dirección de Salud Comunitaria. Mayo de 2000. Secretaría de Salud. GCBA.

## DISCUSIÓN

From the analysis of the presented information, appear clearly the impact that have had AIDS about the health of women

patients. Their increment as a cause of death have been the most important among all causes of female death, 23.5% of 1.808 analyzed death. This numbers, regrettably coincide in time and percentage with the outcomes of Hadad *et al.* (2000) in Brasil. Evidently this is definitely a serious health problem in Buenos Aires City and need an urgent take of decisions and plan implementation. Also we can observe that as well as among those dead by cancer, whereas there are isolated cases between 20 and 30 years old patients, it start to increase their frequency after 30 years old, which define a population to look after, but AIDS does not respect any age, and it frequency start to increase ten years before than cancer as a cause of female death. An essential datum if is wanted to have the real information about female mortality, is not to search only in Obstetric & Gynecological Services. As we can see in table 6, only 52.2% of female death were registered in this Services. The 21.2% occurred in ICU and 12.4% in ED. This also impose the need of a different organization in the task to detect female mortality. Respect to the 113 MM, the 33.6% obeid to DC and between them, the main cause was abortion. This fact also translate a social problem that should reinforce the family planning policy at the Public Hospitals in the Buenos Aires city. Unwanted pregnancy is not only a problem in our country. It has been shown that with or without illness, in USA more than half of pregnancies are unwanted. The same happen in our country. So, give to our women preconception advise and become easier the access to contraceptive methods, should have a high impact in the health of women in reproductive ages. Not only abortion is the problem, but the fact that hemorraghe and hypertensive disease are also important causes of MM, suggest that there is a lot to do to encourage and stimulate prenatal control, precocious detection of maternal diseases potentially lethal and why not, to go overt the guidelines of procedures and the most effective way to put them in practice in our maternity.

The study of IC deceased women, again underscore that among pregnant women AIDS is a serious problem. It could be interesting to analyze the level of accomplishment of the 076 Protocol from CDC, the persistence in Obstetrics & Gynecology Services to detect the AIDS virus status of the patient, the handle of a newborns in Neonatology Units and finally, become universal the test for detection of virus state in all pregnant women to allow start precociously the adequate treatments to decrease the viral charge and decrease the vertical transmission. Is almost alarming that the second indirect cause of MM have been oncological illness. Evidently this patients were without diagnosis and the diagnosis was done when they finally booked, but the cause of consultation was not the disease but pregnancy. Obviously, efforts should be increased to cover most of female population with detection systems like programs for cervical and breast cancer detection. Another worrisome datum is seen in table 8. The total deceased women in reproductive age have increased from 1992 to 1998, remaining continuous the percentage of MM. Regrettably, this datum demonstrated that the efforts done until the present time does not achieve the target, so are necessary urgent studies and measures from specialists to modify the pathway of women health in Buenos Aires city. Simultaneously, the Table 9 show us that the contribution of abortion to MM have duplicate during the last years. Probably it is the moment to abandon discussions that become quiet to controversial people but are not translated in effective health actions. A subject that is worrying to much to authors such Clark & Belfort like others (8-9-10-11) is the noticeable

increment of cardiological disease as cause of MM. Probably, like they say, more people are surviving their childhood been carriers of heart illness and reach the age to become pregnant. Also, is probably that in many cases nobody knows that this pregnant woman is a carrier of heart disease, losing the opportunity to control and treat in the right way. More worrisome are those patients who become pregnant without know that they are carriers of vascular and heart illness. For this reason and based in the statistics published, in the Hospital Aleman at Buenos Aires city, all pregnant patient is evaluated for a specialized cardiologist in pregnancy heart modifications about 20 week's of gestational age, the period considered as the start of the overcharge of the vascular system. The outcomes and findings of the presence of heart diseases without diagnosis previously are worrisome and amazing. May be probably that without to have done this kind of evaluations, our Service could present a too much high rate of MM because heart illness. Finally and also regrettably, we have serious problems in front to the official information. Systematically, the official rate of female mortality have been lesser for the same period of time that the rate obtained by the present study. The most eloquent datum belong to the year 1998, where the official rate is one death 10.000 live birth and the rate concluded by the present study is 14 every 10.000 live birth. Evidently, is clear that the method to search for the rate and cause of deceased female in reproductive ages should be revised. On other way and thinking that the rate is 1/10.000 obviously the proposals to control female mortality should be different that if we assume that the real rate is 14/10.000. We think that is urgent that the Buenos Aires city Government focus about a project to build a Permanent Commission to detection and vigilance of mortality of women in reproductive age, in the same way it is doing in developed world. For some readers, it could seem a local problem analysis, but it is not. The study, have much to do too with the problematic about female and maternal mortality in most of developing countries.

## Conclusion

- The main cause of death of women in reproductive age is AIDS, with a constant increment from 1992 with an increase rate of more than 300% in the year 1998.
- The second cause of death is breast and cervical cancer.
- The AIDS touch all age groups between 10 and 49 years old. The cancer increase clearly their incidence in the case of breast cancer after 35 years old and in the case of cervical cancer after 30 years old patients. The MM affect fundamentally patients between 15 and 44 years old.
- The death of women in reproductive ages should be searched among all the deceased patients at Hospitals and not only among the death occurred in the Obstetrics & Gynecology Services.
- The 33.6% of MM were because a direct cause and between them, the main was abortion, with an incidence of 50%. The following causes were hemorrhages (28.9%) and hypertensive diseases associated to pregnancy (21.5%). The 18.6% of maternal death were because an indirect cause, and the most frequent cause was AIDS with 57.14% and then cancer (42.85%).

- The deceased women at reproductive ages doubled between 1992 and 1998, the MM also increased and doubled between 1992 and 1998.
- The relationship abortion-maternal death has increased from 14.3% in 1992 to 35.7% in 1998.
- The official rates informed systematically lesser levels of women mortality. This difference was 14 times lesser for the year 1998.

## REFERENCES

- Albuquerque R, Cecatti J, Ardí E, et al. 1998. Causes and factors associated with reproductive age female mortality in Recife, Brasil. *Cad Saude Publica*, 14: 41-8.
- Andreea A. Creanga, MD, PhD, Carla Syverson, CNM, MN, Kristi Seed, BSc, and William M. Callaghan, MD, MPH Pregnancy-Related Mortality in the United States, 2011–2013. *Obstet Gynecol.*, 2017;130:366–73.
- Andreea A. Creanga, MD, PhD, Carla Syverson, CNM, MN, Kristi Seed, BSc, and William M. Callaghan, MD, MPH Pregnancy-Related Mortality in the United States, 2011–2013. *Obstet Gynecol.*, 130:366–73.
- Clark SL, Christmas JT, Frye DR, Meyers JA, Perlin JB. 2014. Maternal mortality in the United States: predictability and the impact of protocols on fatal postcesarean pulmonary embolism and hypertension-related intracranial hemorrhage. *Am J Obstet Gynecol.*, 211:32.e1–9.
- Haddad N, Silva M. 2000. Female mortality in reproductive age in the State of Sao Paulo, Brazil, 1991-1995: underlying causes of death and maternal mortality. *Rev Saude Publica*, 34: 64-70.
- Haddad N, Silva M. 2000. Mortality due to cardiovascular disease in women during the reproductive age (15 to 49 years), in the State of Sao Paulo, Brazil, from 1991 to 1995. *Arq Bras Cardiol.*, 75: 375-9.
- Marian F. MacDorman, PhD, Eugene Declercq, PhD, and Marie E. 2017. Thoma, PhD Trends in Maternal Mortality by Sociodemographic Characteristics and Cause of Death in 27 States and the District of Columbia *Obstet Gynecol.*, 129:811–8.
- Melissa E. Bauer, DO, Robert P. Lorenz, MD, Samuel T. Bauer, MD, Krishna Rao, MD, MS, and Frank W.J. Anderson, MD, 2015. MPH Maternal Deaths Due to Sepsis in the State of Michigan, 1999–2006. *Obstet Gynecol.*, 126:747–52.
- Sala M, Dosemeci M, Zahm S. 1998. A death certificate-based study of occupation and mortality from reproductive cancers among women in 24 US states. *J Occup Environ Med.*, 40: 632-9.
- Steven Clark and M. Belfort, 2017. The Case for a National Maternal Mortality Review Committee. *Obstet Gynecol.*, 130: 198-202.
- Wessel H, Reitmaier P, Dupret A, et al. 1999. Deaths among women of reproductive age in Cape Verde: causes and avoidability. *Acta Obstet Gynecol Scand*, 78: 225-32.