

3D Display of Stillbirth in Indonesian Obstetrics Part 3: Antenatal Visits as Preventive Determinant

R. P. Bernard¹, S. Sastrawinata²

¹Int. Fed. for Family Health (IFFH), & Int. Ass. for Maternal and Neonatal Health (IAMANEH), Geneva

²Coordinating Board of Indonesian Fertility Research (BKS PENFIN), & Int. Fed. for Family Health (IFFH), Bandung

¹Field Epidemiology & Liaison Office, IFFH/IAMANEH, 22 Av. Riant-Parc, 1209 Geneva, Switzerland

²Secretariate, BKS PENFIN, Hasan Sadikin Hospital, Bandung, Indonesia

Introduction

In two previous reports (1,2), the risk of stillbirth in Indonesian university obstetrics from 1978 to 1980 was given as a bivariate function of the six possible *binary combinations* of four factors: (a) birth weight, (b) complication of delivery, (c) maternal morbidity, and (d) registration status. This "closed tetravariate control system" (*QUARTET*) showed *prolonged/obstructed labor* to be a major contributor to the absolute "top-referral" risk of stillbirth (SB) (54.9/1000; Fig.5). Elimination of this category of primary complication would lead to an absolute risk of SB of only 44.8/1000 - an improvement of 18.4%. 26.5% of all the stillbirths (536/2020) were associated with prolonged/obstructed labor as primary complication - which in turn constituted 10.0% (3685/36790) of all singleton births.

But *booked* cases with prolonged/obstructed labor showed a surprisingly low risk of SB (14.7/1000) as compared with *not booked* cases (122.5/1000), *midwife referrals* (164.1/1000), *physician referrals* (224.0/1000) and *emergency admissions* (452.8/1000) - a risk chain with a factor of 30.80. Since booked cases generally imply some form of pregnancy care, the next analytical step is to co-control for *antenatal visits* (AV). This pictorial "3D feedback" illustrates patterns of risk of stillbirth by antenatal visits and the four co-controls (a-d). Together with the previous reports (1,2), a "closed five-factor control system" (*QUINTET*) of SB is thus obtained.

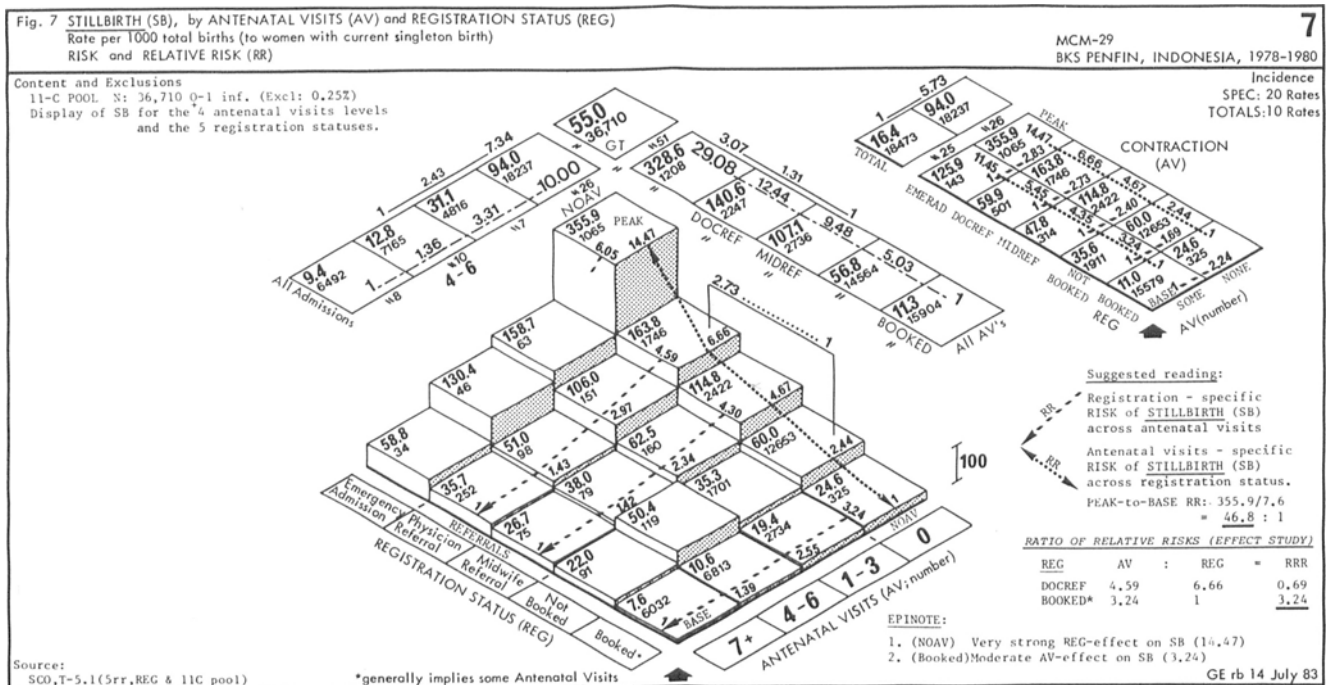
Material and Method

The material and method is unchanged. The only source are standard computer outputs (SCO's) from the Maternity Care Monitoring (MCM)-library pertaining to deliveries from 1978-1980. Figs. 7-10 were developed from *secondary calculations* with the risk tables' information drawn to scale on *wide angle isometric paper*.

Results

Access to baseline: Background information is programmed into the figures, as are suggestions for reading statistics and succinct quantitated statements (ratios & 'epinotes'). The figures are self-contained 3D-exhibits of risks of stillbirth (SB) by *antenatal visits* (AV) and co-controlled for registration status (Fig.7), maternal morbidity (Fig.8), primary complication of labor/delivery (Fig.9), and infant birth weight (Fig.10). Dotted lines pointing to the *right* are "risk chains" across the four control variables among women with *no antenatal visits during the current pregnancy* (NOAV). Dotted lines pointing to the *left* are risk chains across *antenatal visits* within categories of the four control variables. Relative risks (RR) are inscribed and electively put to ratio (RRR). The "roofs" are the totals (row, column, grand). Summary risk tables are given in the right upper corner with contraction of AV into "NONE" and "SOME".

Risk of SB for "NOCARE"-Women (NOAV): This SB risk is 94.0/1000, 5.73-fold the SB risk to infants born to women with some AV: 16.4/1000. This "AV-effect" is the most consistent finding of this analysis. But for women with NOAV, the low extreme of the risk gradients across the four co-control variables is 24.6/1000 for booked cases, 32.2/1000 for healthy women, 46.4/1000 for women with no complications of labor/delivery, and 53.9/1000 for infant birth weights of 3000-3499 grams. Hence, the "combination" of *booking/no morbidity/no complications/optimal birth weight* emerges as the *lowest risk profile* with maximal likelihood of late fetal survival. The *high extreme* of the risk gradients among women with NOAV is 355.9/1000 for emergency admissions, 331.3/1000 for hemorrhage per vagina, 763.4/1000 for placenta abruptio, and 491.8/1000 for infant birth weight below 1500 grams. This "combination" is the *highest risk profile* with the maximal likelihood of late fetal death.



Still among "NOCARE"-women, the SB risk relative (RR) to that associated with healthy women (Fig.8; 32.2/1000) is 2.44 for anemic women without hemorrhage (AW), 4.78 for women with hypertensive disorders of pregnancy (HDP), and 10.29 for women with hemorrhage per vagina (HPV). Hence there emerges a 322% excess risk of SB for HPV over AW (331.3/78.5 - 1) vs an excess risk of SB for AW over healthy women (HW) of 144.0% (78.5/32.2 - 1). For "NOCARE"-women, the SB risk relative (RR) to that associated with no complications of labor/delivery (Fig.9; 46.4/1000) is 4.11 for prolonged/obstructed labor, 4.96 for placenta previa, and 16.45 for placenta abruptio. Finally, among "NOCARE"-women, the SB risk relative (RR) to the lowest across birth weight (53.9/1000; Fig. 10), and hence referred to as optimal birth weight (3000-3499 g), increases in both weight directions: to 2.45 for 1000g lighter weight ("moderate LBW": 2000-2499g), & to 1.91 for at least 1000g larger weight ("large W": 4000+g). In sum, very strong effects on the risk of SB are documented among "NOCARE"-women for registration and status, maternal health status, complication status, and birth weight, as summarized in the EPINOTE of Figs.7-10.

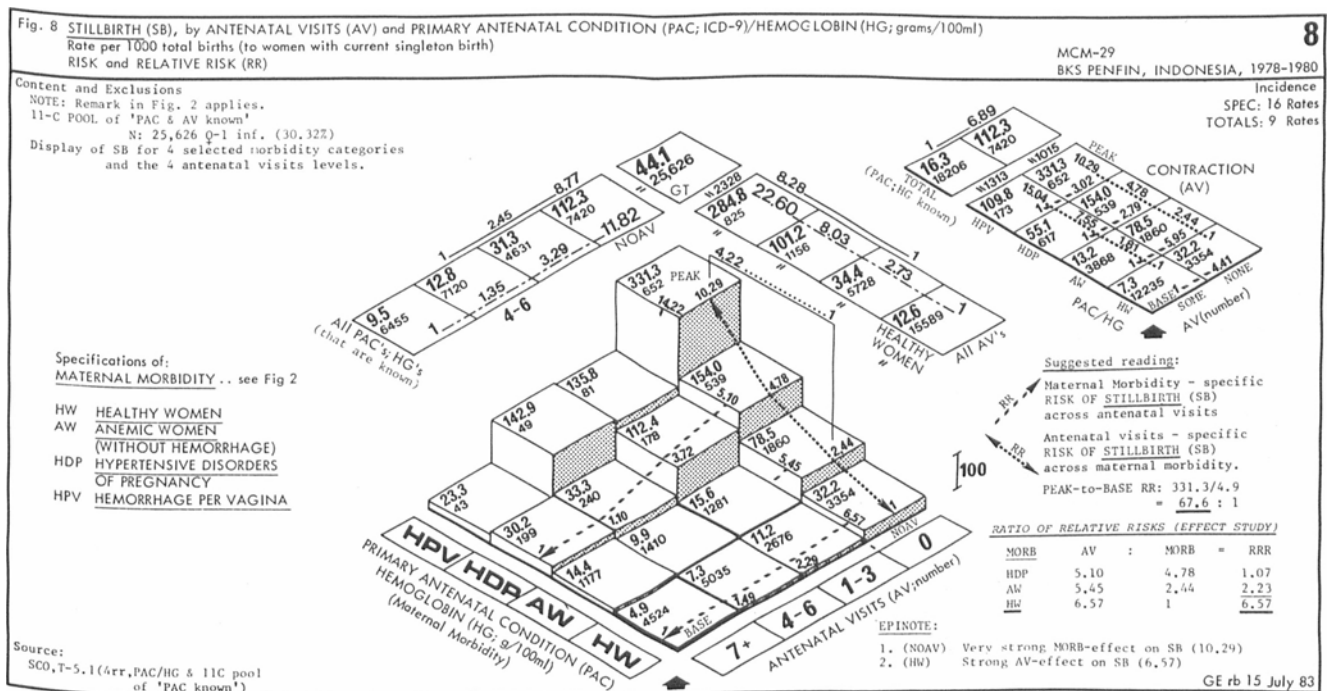
Risk of SB for "CARE"-women (AV): Overall, a ten-fold "decline" in the risk of SB is documented when passing from 0 to 7+ antenatal visits (94.0/9.4 = 10.0). Most important, even among women who satisfy specific components of the "low risk profile", manifold decreases in risk of SB are associated with increasing antenatal visits during the current pregnancy. The relative risk (RR) of stillbirth for NOAV vs 7+ AV is 3.24 among the booked cases (Fig.7), 6.57 among healthy women (Fig.8), 6.36 among women with no complications of labor and/or delivery (Fig.9), and 10.17 for infants with optimal birth weight (Fig.10). But also for "high risk groups", manifold "decreases" in the SB rate are documented. The relative risk (RR) of SB for NOAV vs 7+ AV is 4.59 for physician referrals, 5.45 for anemic women without hemorrhage, 5.10 for hypertensive disorders of pregnancy, 10.70 for prolonged/obstructed labor, 5.70 for infant weights 2000-2499g, 6.53 for infant weights 4000+g, etc. In sum, strong to very strong AV effects on the risk of SB are documented among groups of women with or without specific morbidities, complications and other risk attributes. Antenatal visits emerges as a likely key determinant of late fetal survival with monitoring data.

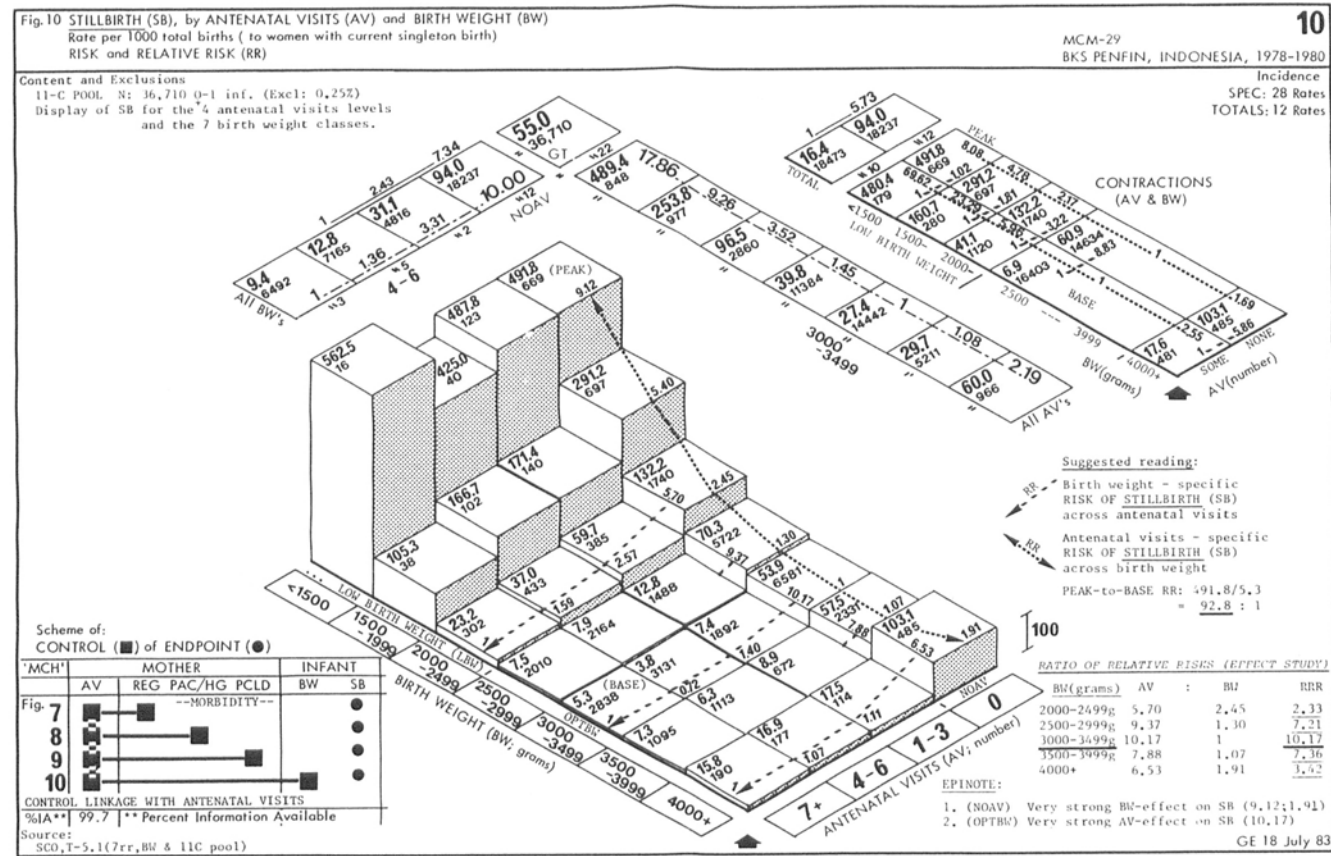
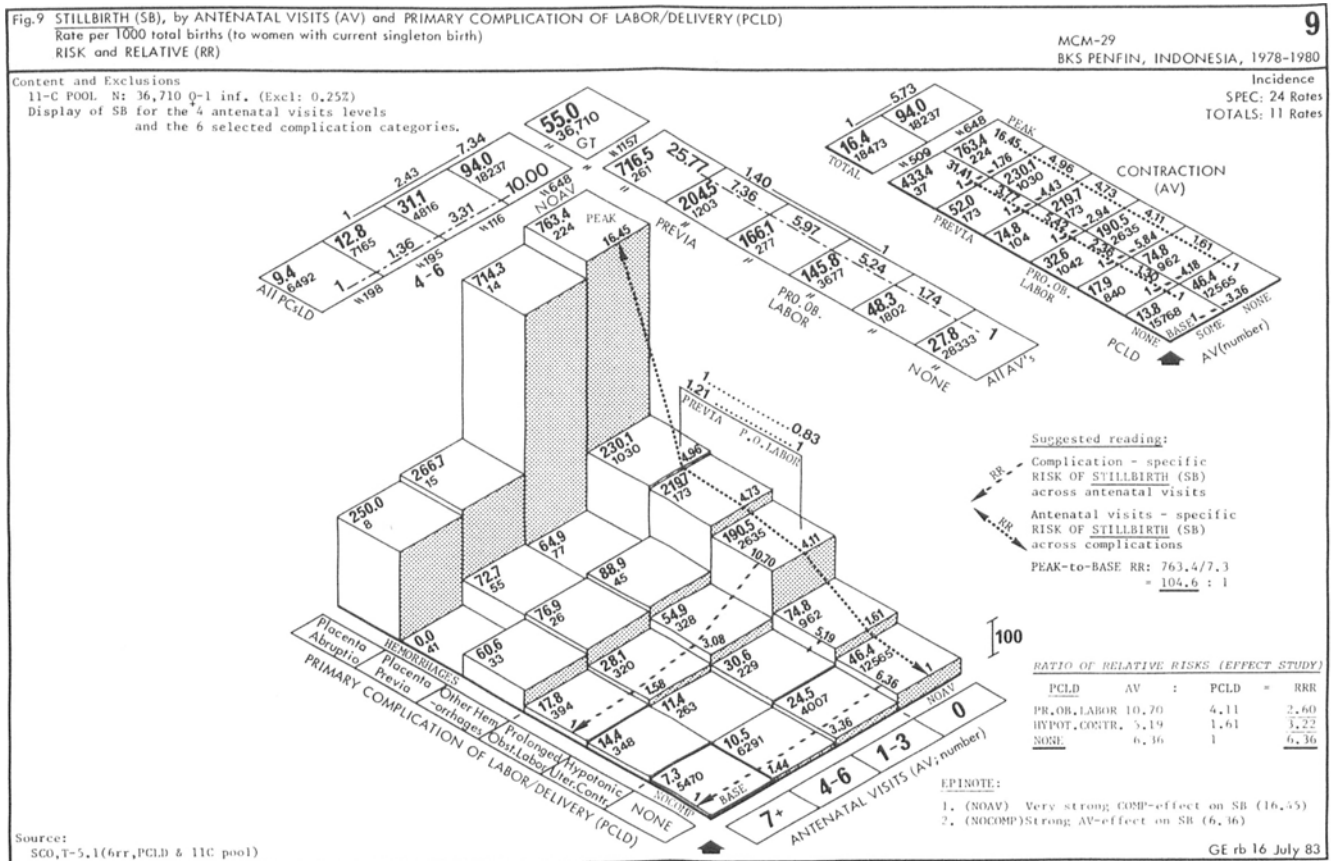
Ratio of Relative Risks (RRR) of SB: The 3D display of the dual-control SB risks enables the service providers to study for themselves the associated benefit of selected intervention factors on the late fetal outcome. Intuitively, they may put to ratio two relative risks pertaining to a given bi-specific entity. Actually, it

is hypothesized that this new possibility of "self-discovery" may carry an epidemiological dimension into the many disciplines of reproductive health care provision.

This interdisciplinary democratization of access to risk information may become a new avenue to accelerated professionalization of the currently sprouting efforts in reproductive health care provision. Figures 7 to 10 show many situations where the SB-reducing effect of AV is stronger than the SB-increasing effect of a specific risk factor. For instance, the risk of SB for various maternal morbidities may be improved to levels below that currently applying to healthy women with no care. As shown in Fig. 8, the RRR for anemic women is 2.23 (5.45/2.44) in favor of AV - a decrease of the SB rate by 55.3% for 7+ AV as measured against the observed risk of SB for healthy women without any pregnancy care (1 - 14.4/32.2). Even for hypertensive disorders of pregnancy (HDP), the RRR of 1.07 (5.10/4.78) is slightly in favor of AV, an interesting finding. In the same manner, one can scrutinize the risk patterns for primary complications of labor and/or delivery. As shown in Fig. 9, the RRR for prolonged/obstructed labor is 2.60 (10.70/4.11) in favor of AV - a decrease of the SB rate by 61.6% for 7+ AV as measured against the observed risk of SB for women with no complications of labor/delivery and no pregnancy care (1 - 17.8/46.4). Hypotonic uterine contractions has a RRR of 3.22 (5.19/1.61) with a decrease of the SB rate by 69.0% (1 - 14.4/46.4). As encouraging are the RRR's observed for the birth weights other than optimal. As shown in Fig. 10, the RRR for moderate LBW (2000-2499g) is 2.33 (5.70/2.45) in favor of AV - a decrease of the SB rate by 57.0% for 7+ AV as measured against the observed risk of SB to infants with optimal birth weight (3000-3499g) born to women with no pregnancy care (1 - 23.2/53.9). The RRR for large babies (4000+g) is 3.42 (6.53/1.91) in favor of AV - a decrease of the SB rate by 70.7% for 7+ AV as measured vs the observed risk of SB for infants with optimal birth weight (3000-3499g) born to women with no pregnancy care (1 - 15.8/53.9). In sum, the 3D exhibit of risk patterns enables various disciplines to appreciate on their own and with their own data the risk-reducing power of specific preventive intervention. The current 3D exhibit (Figs. 7-10) produces evidence to the effect that antenatal visits may compensate for many risks inherent to maternal morbidities, obstetrical difficulties, and birth weights other than optimal.

A "NOCARE" Prevalence Baseline: Since antenatal visits emerges as a powerful determinant of late fetal survival, it is desirable to calculate the current "unmet need", that is the proportion of women with NOAV.





The proportion of women delivering at the top referral/training system in Indonesia with no antenatal visits (NOAV) is given by education and either by maternal age (TABLE 1) or contraceptive use shortly before the current conception (TABLE II). Overall, quite precisely on half had no antenatal visits (49.7%). Also, a

strong "education effect" on (NO)AV emerges within all age groups and all contraceptive use groups. For example, among women aged 30-34 years, 76.1% had NOAV for NOED vs only 31.9% for 13+ years education - a prevalence ratio (PR) of 2.39. This important decrease in NOCARE with education confirms general knowledge. Two

TABLE I. Percent women with no antenatal visit (NOAV), by Education and Maternal age. N = 36,679

AGE(yrs):	-19	20-24	25-29	30-34	35+	TOTAL
ED(yrs)						
0	% 79.9 n 234	71.7• 407	71.2 313	76.1• 398	77.0 740	75.3 2092
1-6	% 64.8 n 2528	58.7 5738	53.6 3654	57.0 2578	62.2 2962	58.8 17460
7-12	% 43.1 n 1156	38.2 5703	34.8 4727	36.3 2345	41.9 1431	37.6 15362
13+	% 22.2 n 18	36.8• 394	36.6 729	31.9• 433	27.8 191	34.4 1765
ALL ED's	% 59.1 n 3936	48.8 12242	43.4 9423	48.0 5754	57.6 5324	49.7 36679

Source: SCO, T-4.6(Srr AGE & 11C Pool) Excl: 0.33%

• AGE-specific prevalence of NOAV across ED "-"
•• ED-specific prevalence of NOAV across AGE "v"

TABLE II. Percent women with no antenatal visit (NOAV), by Education and Contraceptive use. N=36,662

CONUSE:	NONE	WITHDR/ RHYTHM	CONDOM	ORALS	IUD	TOTAL
ED(yrs)						
0	% 76.4• n 1874	84.4 32	75.0 24	61.7• 115	56.8 44	75.3 2089
1-6	% 60.7 n 15204	59.4 180	42.2 218	43.7 1326	47.6 513	58.7 17441
7-12	% 39.7 n 12396	32.4 244	33.2 274	26.8 1686	27.4 760	37.4 15360
13+	% 35.5• n 1407	29.6 44	31.0 29	27.7• 184	29.6 108	34.1 1772
ALL ED's	% 52.0 n 30881	45.2 500	38.5 545	34.8 3311	35.7 1425	49.6 36662

Source: SCO, T-28.1(lrr NOAV/11C Pool) Excl: 0.38%

• CONUSE-specific prevalence of NOAV across ED "-"
•• ED-specific prevalence of NOAV across CONUSE "v"

Other "effects" are notable. For three age groups up to 12 years education, a *V-shaped prevalence pattern* of NOAV may imply that at least part of the previously observed *V-shaped, U-shaped, J-shaped, reversed J-shaped* patterns of various endpoints across maternal age (3) may be explained with "less care" at the age extremes (teenage and late age). This points to the need for inclusion of "care variables" in future studies that assess reproductive risks. Finally, within the four education levels, contraceptive use is in general associated with a smaller prevalence of NOAV than is absence of contraceptive use. The examples in TABLE II were marked for the comfortable cell sizes. Among women with 7-12 years education, 39.7% had NOAV if no contraceptive use vs only 26.8% NOAV with previous use of orals - a prevalence ratio of 1.48. For women with 1-6 years education, the corresponding figures are 60.7% and 43.7% with a prevalence ratio of 1.39. This implies that contraceptive use may per se "promote" antenatal visits, and that therefore, at least part of the (statistical) claims of the beneficial effects of contraceptive use on a subsequent pregnancy outcome might be linked with an intermediate intervention variable: antenatal care.

Deduction and Analytical Continuation

By introducing - as co-control of the prevalence of NOCARE - contraceptive use shortly before the current conception (CONUSE = FP, Family Planning), evidence appeared to the effect that FP may act as a promoter of AV rather than as a direct operator on pregnancy outcome. The next analytical step is thus to introduce as new control family planning - to be developed in part 4.

Summary and Outlook

Expansion of previous analytical work with MCM data in Indonesia focuses on antenatal visits (AV). AV is introduced as a systematic co-control of the risk of SB with either registration status, maternal morbidity, complication of labor/delivery or birth weight. 20 out of 22 control categories reveal risk profiles dependent on antenatal visits, the two exceptions being placenta abruptio and very low birth weight (<1500g). A systematic confrontation of relative risks obtained across antenatal visits with relative risks obtained within the four co-control variables highlights AV as being an important preventive determinant of late fetal death. In a second step, a clinical baseline of "NOCARE" shows a very strong association with education and a weak association with family planning within controlled education categories. A *v-shaped pattern* across maternal age is also noted. Two hypotheses are derived. Since FP precedes AV, the next analytical focus is on FP (CONUSE). If co-controlled with the five control factors used so far, the QUINTET will lead to a "closed six-variable control system" (SEXTET) of the risk of stillbirth.

Zusammenfassung und Ausblick

Im Rahmen einer breitangelegten Ueberwachung der Geburten (Maternity Care Monitoring: MCM) an den Universitätsfrauenkliniken in Indonesien von 1978-1980 analysiert diese Arbeit die Beziehung zwischen Schwangerschaftsbetreuung und Totgeburten. Zum besseren Verständnis werden die Todesraten in der dritten Dimension (3D) dargestellt. Die Verhältnisse der relativen Risiken werden somit anschaulicher und dienen dem nächsten Schritt in der gezielten offenen Analyse und der Formulierung neuer Forschungsideen. In 20 (von 22) Teilvergleichen für spezifische Kategorien der (a) Klinikaufnahme, (b) des Geburtsverlaufs, (c) des Gesundheitszustandes und (d) des Geburtsgewichts findet sich eine starke Beziehung zwischen mangelnder Betreuung und Totgeburten. Eine Prävalenzstudie der "Nichtbetreuten" zeigt, dass die Teilnahme an Familienplanung die Betreuung während der Schwangerschaft fördert. Dies könnte eine Erklärung der Beziehung zwischen Familienplanung und Lebendgeburten sein.

Résumé et Perspective

Dans le cadre d'une enquête de type "monitoring" - (Surveillance des Soins de Maternité: SSM), ce travail propose l'étude du risque de mortinatalité en fonction des consultations prénatales. Le souci didactique, en vue d'une participation des cliniciens à la stratégie d'analyse et la compréhension par étapes des résultats, mène à une représentation tridimensionnelle (3D) des risques, facilitant ainsi la compréhension des résultats. Ainsi, le clinicien peut confronter des risques et les risques relatifs, induire des hypothèses, suggérer les analyses ultérieures, et autres études. La survie foetale tardive est fortement liée aux consultations prénatales dans 20 sur 22 comparaisons partielles pour des catégories spécifiques (a) de l'admission en clinique, (b) du déroulement de l'accouchement, (c) de l'état de santé de la parturiente et (d) du poids de naissance de l'enfant. Y échappent seulement l'hématome rétroplacentaire et les poids de naissances de moins de 1500 g. Une étude des prévalences du manque total de consultations prénatales suggère que l'espacement par contraception favorise les consultations prénatales. Ce rôle médiateur pourrait expliquer une liaison entre le PF et la survie fœtale.

References

- BERNARD RP, SASTRAWINATA S.: 3D Display of still-birth in Indonesian obstetrics; Part 1: Birth weight, complications, and morbidity. Sozial- und Präventivmedizin 28,208-209(1983)
- SASTRAWINATA S, BERNARD RP.: 3D Display of still-birth in Indonesian obstetrics; Part 2: Booking, referrals, and emergency arrivals. Médecine sociale et préventive 28,210-211(1983)
- OMRAN AR, STANDLEY CC.: Further studies on family formation patterns and health. WHO, Geneva (1981)