

WEB TABLE I IMPACT OF REGIONALIZATION

Reference	Country	Study period	Study design	Number of units	Intervention	Observations
Bode, <i>et al</i> [17]	North Carolina	1968-94	Secondary data	96 Units (level I, II, III)	<ul style="list-style-type: none"> Perinatal regionalization established in 1974 Structured network between primary care providers in obstetrics, pediatrics and tertiary care consultants to ensure referral and transport of women and infants to tertiary hospitals 	<ul style="list-style-type: none"> In 1974, 74%, 21% and 5% of the institutions provided level I,II,III care respectively. Corresponding figures in 1994 were 39%, 47% and 15% respectively. Before 1974, neonates >1501 gms were at low risk of dying if born in hospitals with level III facilities. After 1974, infants <1500 gms were at lower risk of dying if born in a hospital with level III facilities Proportion of deliveries with VLBW outside level III units declined
Goldenberg, <i>et al</i> [18]	Alabama, USA	1970-80	Record review	Population based data	<ul style="list-style-type: none"> Regionalization established Greater efforts to salvage VLBW babies put in 	<ul style="list-style-type: none"> No significant change in the proportion of infants of different birth weight categories except >4,000 g Significant reduction in NMR from 1970-80 for all birth weight categories < 4000 g Maximum decline occur for 1000-1499 g (31.7%), followed by 2500- 3999 g (21%), 2000- 2499 g (20%), 1500-1599 g (18.8%) 80% reduction in NMR occurred in BW<2,500g 50% improvement in NMR accounted by improved survival in different birth weight categories and could not be explained by change in social, economic or nutritional factors
Bowes, <i>et al</i> [3]	Colorado, Canada	1971-78	Secondary data	3 level III, 7 level II and rest level I	<ul style="list-style-type: none"> Regionalization on voluntary basis without specific directives Educational program Regular meetings No external funds to stimulate this change 	<ul style="list-style-type: none"> Decrease in NMR (13.4 in 1971 to 6.9 / 1000 live births in 1978) Minimal decrease in incidence of LBW (9.2 to 8.2%) Increase in VLBW in level III (2.8 to 4.8%) The greatest decline in deaths among VLBW babies seen in level II and III No decrease in fetal mortality
Peddle, <i>et al</i> [10]	Canada	1971-80	Secondary data	2- tertiary perinatal units (level III), 7 regional perinatal centres (level II), 28 community perinatal units (level I)	<ul style="list-style-type: none"> Regionalization established for reproductive care program Collaboration between department of health, University and medical society established Predictable high risk case referred to appropriate regional or tertiary unit 	<ul style="list-style-type: none"> PMR in province dropped from 16.4 to 8.7/ 1000 (p<0.001) PMR declined significantly in regional hospital (18.7 to 12.2, p< 0.001); community hospital (18.4 to 7.0, p< 0.01) In 1971, PMR was highest in community hospital while in 1980, it was maximum in regional units Successful selection of high risk pregnancy and antenatal referral from community hospital has resulted in decreased PMR Minor shifts in number of deliveries from community to regional and tertiary centres

Skelton, <i>et al</i> [19]	Nashville, USA	1973-76	Prospective, pre and post study	55 community hospitals	<ul style="list-style-type: none"> Regionalization established in 1973 80 hours nursing course initiated Neonatal transport program began 	<ul style="list-style-type: none"> NMR declined from 14.9 (1973) to 11.7 (1975) Outborn mortality among < 1000 gms neonates showed an increase while there was a drastic decline in 1001-2500 gms and > 2500 gms categories Outborn admissions decreased in the second year indicating increased number of referrals of high risk mothers.
Walker, <i>et al</i> [20]	Rhode Islands, USA	1974-80	Secondary data	1 tertiary unit and 8 community hospitals (primary neonatal care)	<ul style="list-style-type: none"> Regionalization began in 1974 NICU developed in tertiary arecentres A statewide transport network established, follow up program to evaluate all LBW infants 	<ul style="list-style-type: none"> NMR of LBW babies declined significantly (47% in 1974-75 to 30% in 1979-80, $p < 0.001$) NMR of infants (501- 1000 gms) decreased from 84% to 67% NMR of 1001- 1500 gms babies reduced from 28% to 16% Significant increase in infant transport (1.7% to 2.9%) Increased high risk maternal referral from community hospitals
Hein, <i>et al</i> [4]	Iowa	1978-83	Record review	All hospitals (131) with obstetric facilities (119 level I, 11 level II and 1 level III in 1982)	<ul style="list-style-type: none"> Regionalization established before 1978 Number of level II units increased from 2 in 1978 to 11 in 1983 	<ul style="list-style-type: none"> Level I accounted for 53.9% of all neonatal deaths in 1978 while it reduced to 39% in 1983 There was an increase in mortality rate at level II (31.1 to 38.2%) and level III units (15.0 to 22.8%) Vast majority (78%) of VLBW occurred in level II and III, earlier almost same proportion occurred in level I and II Asphyxia, as a cause of death declined in level I (23.5 to 18.4%), level II (12.6 to 10.1%) while it increased in level III (3.0 to 9.9%) Extremely LBW (< 750g) survival improved in level III Lethal malformation became the leading cause of death in 1982-3 Only 72.6% of deaths could be reviewed from records. Comparative review indicated that asphyxia and sepsis as cause of death are less frequently reported.
Mayfield, <i>et al</i> [12]	Washington, USA	1980-83	Analysis of secondary data	<ul style="list-style-type: none"> Level I- 73 Level II- 11 Level III- 6 	<ul style="list-style-type: none"> All 6 level III facilities were recognized and licensed Level II facilities used published guidelines 	<ul style="list-style-type: none"> Infants < 2000 g was twice as likely to die if born in a level I or II facility compared to level III. For infants > 2000 g, NMR was not influenced by level of care Nursery level has a stronger influence than the volume effect (no. of deliveries) in lowering perinatal mortality rates.
Rosenblatt, <i>et al</i> [21]	Washington	1980-83	Secondary data	<ul style="list-style-type: none"> 90 hospitals (73 level I, 11 level II, 6 level III) 	<ul style="list-style-type: none"> Regionalization established in 1980-83 The system concentrated on referral of high risk cases to tertiary hospitals 	<ul style="list-style-type: none"> Only 16% of VLBW births took place in level I hospital although 45% of all births occurred there The proportion of infants of VLBW births born in level III units is 8 times greater than in level I hospital Mortality rate of < 1500 gms in level III significantly less than level I and higher for > 4500 gms NMR as measured by standardized mortality rates are similar in level I, II and III and not greatly influenced

Campbell, <i>et al</i> [22]	Ontario, UK	1982-5	Prospective study	<ul style="list-style-type: none"> • 32 hospitals (30 level II / I and 2 level III) 	<ul style="list-style-type: none"> • Regionalization encouraged through voluntary participation in a perinatal outreach program • Nursing education provided for better prediction and management of perinatal complications • Outcome of patients reviewed periodically • Transfer encouraged for women at risk • Educational program-management & stabilization during neonatal transfers 	<ul style="list-style-type: none"> • The odds of death decreased between 1982 and 85 (OR= 0.045; 0.003-0.970) • The odds of still births reduced with increasing birth weight (OR= 0.007; 0.001-0.05) • The proportion of births of infants weighing 500- 1499 g increased from 49% to 69% at level III • Neonatal transfer rate increased from 26.2% to 47.9% (p<0.05) in babies 500- 1499 g and decreased from 10.2% to 7.1% among babies 1500- 2499 g (p<0.03)
Hein, <i>et al</i> [23]	Iowa	1995-96 Comparison done with time frame 1982-83	Record review	<ul style="list-style-type: none"> • All 107 hospitals offering obstetric services • Level I- 94 • Level II- 10 • Level III-3 	<ul style="list-style-type: none"> • Regionalization established before 1978 • Advancements and additions in tertiary care levels 	<ul style="list-style-type: none"> • Decrease in mortality in level II by 11.2% and increase in mortality in level III units by 10.7%, and that of level I units remained unchanged • Proportion of asphyxia deaths remained unchanged in level I, while in reduced from 10.1 to 6.9% in level II and 9.9 to 5% in level III. Respiratory distress reduced at all levels • Actual NMR for each level of care decreased at all levels and % of deaths due to malformations and extremely LBW babies had increased.
Kirby, <i>et al</i> [11]	Arkansas, USA	1985-89	Analysis of secondary data	<ul style="list-style-type: none"> • level I- total units not mentioned • level II-10 • level III-3 	<ul style="list-style-type: none"> • Regionalization promoted • Level II hospitals lacked 24 hour in house staff but had the capability to handle wide range of procedures • Level III had in house NICU 	<ul style="list-style-type: none"> • Fetal mortality rate (FMR- 20 wks higher) was similar among level I and II facilities (7.2 and 7.3/ 1000 live births) but 1.7 times higher at level III hospitals • For birth weights < 2000 g, birth weight specific FMR and NMR at level I facilities significantly higher than level III facilities • For birth weights > 2000g, NMR higher in level III than level I
Rosenblatt, <i>et al</i> [24]	Wales (UK) v/s Washington	1989-90	Analysis of secondary data	<ul style="list-style-type: none"> • Wales- level I- 13, level II- 11, level III- 4; • Washington- level I- 63, level II- 11, level III- 6 	<ul style="list-style-type: none"> • Washington has an evolved regionalized system while Wales had recently begun the process • Majority of the level II units in Wales were technologically of intensive care standard while it was not so in Washington, where focus was to spread technology according to units, level III were developed more technologically 	<ul style="list-style-type: none"> • Neonatal care much more regionalized in Washington • VLBW babies are much more likely to be born in a referral centre in Washington than Wales • Babies weighing 1000-1499 g fared less well if born in level I facilities than level III • 65% of Washington babies (1000-1499g) were born in referral centres (level III) whereas 45.9% of such babies were born in referral units in Wales • Wales' referral centres have a lower NMR for babies weighing > 1000 g than similar hospitals in Washington (2.7 v/s 4.7 deaths per