



**USE OF OXYTOCIN AND OTHER INJECTIONS DURING
LABOR IN RURAL MUNICIPALITIES OF GUATEMALA:
RESULTS OF A RANDOMIZED SURVEY**

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I. ABSTRACT

Oxytocin, a natural hormone, induces forceful contractions of the uterus at or near the time of delivery. In the hands of obstetricians, a synthetic analogue may be administered to induce labor, increase the rate of progress of labor, or control post-partum hemorrhage. These desirable traits of oxytocin are well known worldwide and, in many countries where MotherCare works, including Bangladesh and Indonesia, an oxytocin injection is sought by women or their families, living even in remote rural areas, to hasten delivery. In the hands of traditional birth attendants, local pharmacists, injectionists, or even peripheral staff of health services who have access to oxytocin through local health supplies or pharmacies, this product can be deadly. Administered in the wrong amounts, through the wrong means, often unmonitored, it has resulted in deaths of women through ruptured uterus or deaths of infants through asphyxia. In a rural Guatemala community, for example, oxytocin injection administered by traditional birth attendants was significantly associated with an increased risk for intrapartum and early neonatal deaths. Following up on this observation, this report summarizes the systematic investigation of the frequency of use of oxytocin injection by untrained birth attendants during labor and delivery in the rural municipalities throughout Guatemala.

II. BACKGROUND

Oxytocin is a potent hormone naturally derived from the posterior pituitary gland of humans and several other mammalian species. Oxytocin, and more recently its synthetic analogue, has become an important pharmacologic tool in the management of labor and delivery: its effect, both as produced naturally by parturient women and as used pharmacologically, is to induce forceful contractions of the uterus at or near the time of delivery. In modern obstetrics, oxytocin - administered by carefully controlled intravenous infusion with careful monitoring of the condition of mother and foetus - may be used to induce labor in circumstances where this is warranted, and to increase the rate of a labor that is progressing inadequately. Oxytocin is also one of the drugs (although not the drug of choice) that is useful in control of post-partum hemorrhage caused by uterine atony or hypotonia.

When the potency of this hormone and its usefulness in obstetric practice was first being recognized, its potential adverse effects on mother and foetus were less appreciated. However, obstetric experience, later confirmed by systematic observation and controlled study, identified the pharmacologic use of oxytocin to be associated with important complications of labor and delivery (1-2). For the laboring mother, oxytocin use was infrequently but significantly associated with rupture of the uterus resulting from excessively forceful contractions (3).

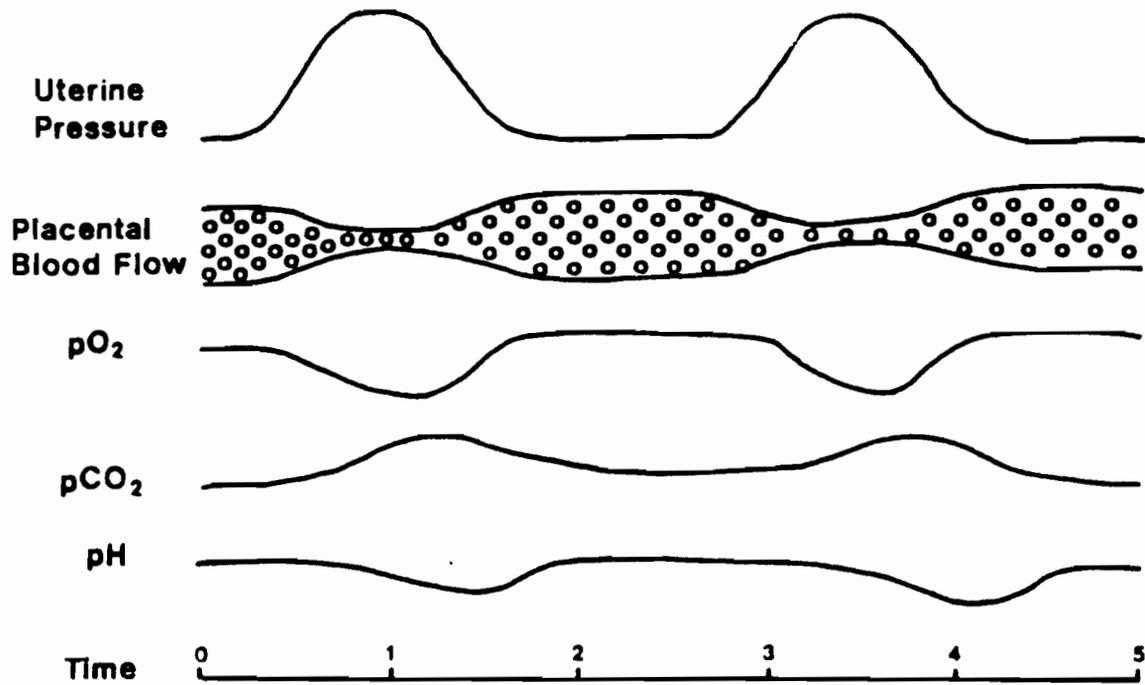
More commonly, though perhaps recognized more by pediatricians than by obstetricians, was the association of oxytocin use with distress of the foetus during labor, and in the most severe cases with foetal asphyxia (4-7). This effect on the foetus can in part be explained by the alterations in factors significantly affecting foetal well being during labor and delivery, as shown schematically (and in somewhat simplified fashion) in Figure 1.

During normal labor, as during pregnancy, the foetus maintains its nutritional and physiologic status through its circulation to the placenta. Essential substances - including oxygen and glucose, needed on a constant basis to maintain basic metabolic processes - are received from the mother's bloodstream via the placenta, and waste products - including carbon dioxide and lactic and other acid products of metabolism - are transferred from the foetus to the mother, who is able to metabolize and/or excrete them on behalf of her infant. During the contractions of normal labor, the reduction in placental circulation and exchange resulting from compression of the placenta (and in some cases of the umbilical cord) may result in reduction of receipt of oxygen by the foetus, with transient but tolerable increases in levels of carbon dioxide and acidity of the foetal bloodstream. During the recovery period between contractions, however, these abnormalities are generally rapidly restored to normal levels.

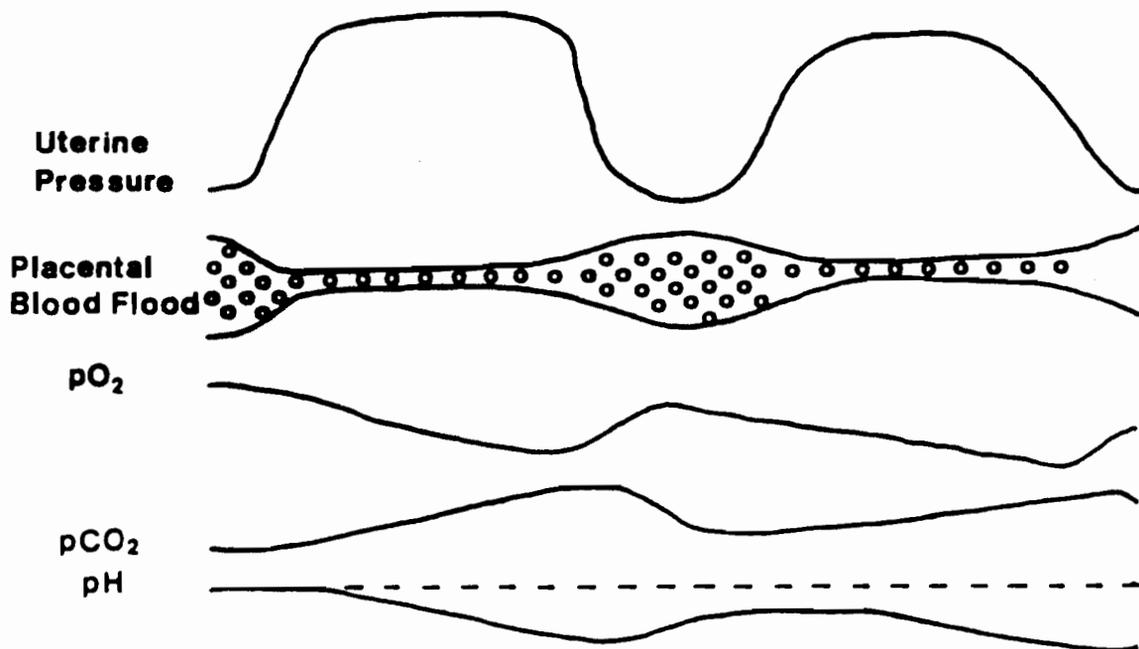
When uterine contractions are substantially increased in frequency and intensity by oxytocin administration (in its most extreme form resulting in sustained intense contraction known as "uterine tetany"), the foetus may be subjected to greater deprivation of oxygen and greater accumulation of carbon dioxide and acid waste products. The interval between contractions may not be long enough to permit recovery of metabolic balance. If this abnormal process is continued, the infant may experience "foetal distress", the clinical term for detectable oxygen deprivation and acidosis. In severe or sustained cases, this distress may result in birth of an asphyxiated infant, or in death of the foetus before delivery is completed.

FIGURE 1

NORMAL CONTRACTIONS



CONTRACTIONS WITH OXYTOCIN



Recognition of these potential dangers of oxytocin use during labor resulted in the present obstetric practices of restricting use of oxytocin to selected cases having clearly defined clinical indications, careful and continuous monitoring of maternal and foetal condition when oxytocin is used, and administration of oxytocin only by carefully controlled continuous intravenous infusion (which can be reduced or terminated if abnormalities are detected, resulting in rapid disappearance of the effects of the hormone).

Several earlier practices in regard to oxytocin use were discontinued when their association with adverse effects were recognized. These included the widespread routine use of "just a touch" of oxytocin. Also abandoned in modern obstetrics was the use of oxytocin by intramuscular injection during labor: this route of administration was found to be associated with unpredictable and erratic absorption, resulting in severe increase in contractions in some cases and in minimal effects in others (another obvious disadvantage of intramuscular injection being that, if adverse effects do occur, there is no way to "turn off" those effects) (7). In some clinics and hospitals, intramuscular injection of a single dose of oxytocin as the foetal head was beginning to be born (but while the birth was still incomplete and the baby was still subject to the possibility of anoxia) had become routine practice, apparently to both give the birth a "boost" and to reduce post-partum uterine hypotonia and bleeding; this practice has also generally been abandoned.

Against this background, the present study of oxytocin use in municipalities of rural Guatemala was prompted by our findings during studies of perinatal and neonatal mortality in Santa Maria de Jesus, Sacatepequez, a traditional indigenous Maya community in the Guatemalan highlands (8). In that community, traditional birth attendants were found to have administered one or more intramuscular injections of oxytocin in over half of all labors. In case-control analysis, oxytocin injection during labor was significantly associated with increased risk of intrapartum and early neonatal death of infants reported by the mother to have demonstrated signs of life prior to the onset of labor. This association was not the result of other factors (such as prolonged labors or malpresentations) that might both have caused difficulties for the foetus and prompted the birth attendant to administer a substance perceived as helpful in accelerating the labor; the association was also independent of the identity of the birth attendant.

In this study community, interviews with mothers and birth attendants indicated that oxytocin injections were administered to "give more force" to the labor. The fact that women who had received such injections had often been able to appreciate the difference in the frequency and intensity of their contractions was considered by them evidence of its efficacy. There was no substantial appreciation of any danger associated with oxytocin injection, with the exception of some birth attendants who had heard that oxytocin might cause rupture of the uterus; however, nobody in their community or any other they knew of had witnessed this complication, so its danger was not particularly credible. Birth attendants and women were unaware of risk to the foetus associated with this practice.

Since the use of oxytocin was viewed favorably in the community, the ability to administer it was a marketable competence among birth attendants; in cases where the birth attendant could not inject, a local injectionist was often called. In many cases, the birth attendants reported (and families confirmed) that the administration of oxytocin occurred at the request of the woman or the family, who often had purchased one or more vials in anticipation of labor. In some cases, birth attendants were called during labor to find that a woman had already been given such an injection; most commonly, however, the birth attendant herself provided and administered the product. Many of the birth attendants and injectionists in the community had gained their ability to administer injections through "community health promoter" training provided by the Ministry of Health as part of its primary health care approach.

In terms of the civil and administrative organization of Guatemala, the community where these investigations were carried out is a "municipality"; that is, it possesses a total population of over 5,000 persons (almost 10,000 in this specific case), a seat of municipal government, and a government health post. It also has an "urban" infrastructure typical of many such rural municipalities, although the majority of the families are engaged in subsistence agriculture and agricultural day labor for their livelihoods. This infrastructure includes several pharmacies. We found that, although sale of oxytocin in pharmacies was supposedly prohibited by the Guatemalan government (supposedly because of its potential use as an abortifacient), in fact oxytocin was available and sold over the counter in several of these pharmacies. Like birth attendants, the personnel of these pharmacies were often empirically trained and had little understanding of the effects or potential dangers of this or many other products that they sold.

To explore this phenomenon further, we undertook a preliminary convenience sample of pharmacies located in 22 municipalities scattered throughout three of the four principal zones of Guatemala (the Highlands, home of the majority of the indigenous Maya population; the Southern Coastal zone, a Latin-dominated area of substantial large agricultural enterprises involving both Ladino and migrant indigenous labor; and the Oriente, a principally Ladino area [the distant and sparsely settled northern area was not accessed]). Without identifying ourselves as public health personnel and without naming a product, we requested "the injection used for births" in pharmacies in each of these municipalities.

In response to this request, the majority of pharmacies sold the investigators 5 international unit vials of oxytocin; those pharmacies that did not have the product were generally able to direct us to another pharmacy where it was available. In every municipality thus investigated, oxytocin for injection was sold to us by some pharmacy in response to this request.

The results of our community-based studies of perinatal death, along with these findings of widespread availability of oxytocin for injection in other municipalities of Guatemala and preliminary information from INCAP studies in Quetzaltenango that also indicated high rates of oxytocin injection use in that distant part of the highlands, led to this study of use of oxytocin use in a sample of municipalities throughout Guatemala.

The purpose of this study was to investigate systematically the frequency of use of oxytocin injection during labor and delivery in the populations of rural municipalities.

III. METHODS

Overview of Study Design

The study was carried out during April-September, 1991, in a randomly selected subset of rural municipalities in Guatemala. In sample municipalities, information was obtained on practices (including use of oxytocin injection) and other aspects of births occurring in the preceding year. This information was obtained by direct structured interview with the mother and family, conducted by a female physician with orientation to community birth practices, using a standardized data collection instrument.

Selection of Study Municipalities

A listing was prepared of all municipalities outside of the capital (Guatemala City), exclusive of the isolated and sparsely populated northern region (Peten, Alta Verapaz, Izabal). This listing was stratified into the three major geographic and demographic regions identified in Guatemala, the Highlands, the South Coast, and the Oriente region. The total population registered in the latest census as resident in these municipalities was also obtained. Based on these listings, a sample of municipalities was drawn separately for each region to provide approximately a 20% sample of the population of each region. The results of this sampling procedure are shown in Table 1. The geographic distribution of municipalities in which the investigation was carried out is shown in Figure 2.

<u>Region</u>	<u>Municipalities</u>		<u>Municipalities</u>	
	<u>Sample Universe</u>	<u>Population</u>	<u>Sample Selected</u>	<u>Population</u>
	<u>Number</u>		<u>Number</u>	
Highlands	39	400,577	11	92,318 (23%)
South Coast	19	189,075	4	39,502 (21%)
Oriente	23	216,985	5	44,302 (20%)

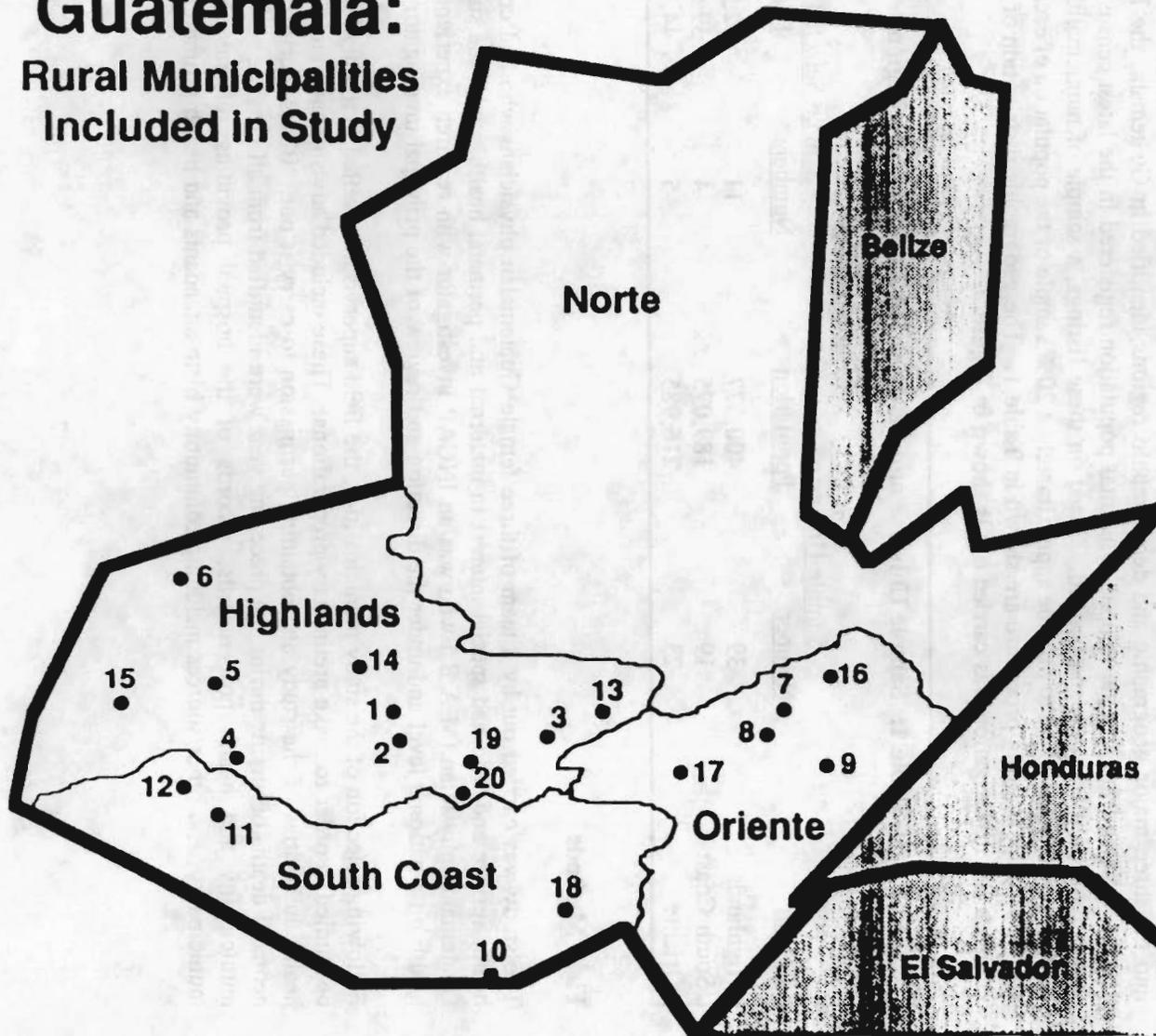
Field Methods

The study was carried out by a team of three female Guatemalan physicians who had completed rural health service and who had special interest in maternal and perinatal health, under the supervision of a Guatemalan physician (M.A.B.) who was an INCAP investigator with research experience in maternal health on a national level and under the direction and review of the principal investigator (A.V.B.).

Following selection of the study municipalities, the field supervisor travelled to the next municipality to be studied in order to make preliminary preparations. These included advising the municipal and public health authorities of the study and obtaining permission to carry it out. Births, perinatal deaths, and neonatal deaths occurring during the preceding year were identified from all possible sources, including municipality and health post records, records of the hospital providing referral services to the municipality, and other sources including community birth attendants and health promoters.

Guatemala:

Rural Municipalities
Included in Study



1. Sta. Apolonia
2. Sta. Cruz Balanya
3. El Chol
4. Sn. Pedro la Laguna
5. Sn. Bartolo
6. Sta. Ana Huista
7. Usumatlan
8. Cabanas
9. Sn. Jose la Arada
10. Iztapa
11. Sn. Jose el Idolo
12. Sn. Lorenzo
13. Sn. Jeronimo
14. Chinique
15. Sn. Antonio Sac.
16. Estanzuela
17. Sansare
18. Guazacapan
19. Santiago
20. Alotenango

FIGURE 2

The field supervisor would also identify appropriate personnel from the community to guide the field investigators to households where births had been identified and to serve as translator if required (in case the informant spoke only an indigenous dialect); these guides/translators were most often community health promoters (usually female). The field supervisor would also identify secure accommodations for the three field investigators, who resided in or as close as possible to the study community while they carried out the data collection interviews during the space of approximately one week in each community.

Because of the wide dispersion of population outside of the municipal centers, for reasons of feasibility and security it was found necessary to restrict the sample of households studied to those lying within a thirty minute walking distance from the municipal center (defined as the health post). Within this sample area, we attempted to identify, locate, and interview all households in which a case of perinatal or neonatal death had occurred during the past year, and 40% of all other households in which a death had occurred during the same period.

Data Collection

Data were collected by direct interview of the mother by one of the physician field investigators, using a standardized instrument and structured interview format. In order to avoid biasing the responses related to oxytocin use, the study was introduced as an attempt to gather information related to the circumstances, occurrences, and outcomes of births; the interview included questions related to the background and obstetric history of the mother, occurrences and practices during pregnancy, labor, and delivery (including, but not restricted to, use of oxytocin and other injections and medications), and condition and post-partum events of the mother and infant.

Study Monitoring

Meetings were held with the field supervisor at the end of each week of data collection to discuss and resolve issues related to methods, review the status of data collection, and plan activities for the following week. Completed questionnaires were reviewed by the field supervisor and by another INCAP investigator experienced in this methodology (the field investigator in charge of the ongoing community-based studies in Santa Maria de Jesus). Monthly meetings, and occasional additional problem solving meetings, were held between the field team and the principal investigator.

Data Processing

Data from completed questionnaires were entered in batches using EPI INFO; data checks were made by using internal programs of EPI INFO and by review of data listings and frequency tables produced from entered data.

IV. RESULTS

Using the methods described, we succeeded in studying a total of 1,118 births. Of these, 567 were in the Highland region, 308 in the South Coast region, and 243 in the Oriente region. The distribution of these births by categories used in the present analyses is presented in Table 2.

<u>Region</u>	<u># Controls</u>	<u>Intrapartum/ Day One Deaths</u>	<u>Neonatal Deaths</u>
Highlands	488	61	18
South Coast	295	8	5
Oriente	240	3	0

While the numbers of births in the Highland and South Coast regions maintain essentially the ratio expected based on census data, the number of births that were found in the Oriente region was lower than expected in relation to census data. This finding was not explained by differences in rates of refusal or failure to complete interviews of sample families, nor by differences in the proportion of municipality populations residing outside the 30 minute zone. We noted this difference and made additional efforts to locate births that might have escaped our detection (for example, checking the birth records of additional hospitals); these efforts did not add substantially to the number of births detected in the Oriente region, and we suspect that the result may reflect an actual difference in the fertility rate in the principally Ladino population of the Oriente (especially in reference to the Highland Maya population).

While the sampling methodology and the various limitations of identification and location of families in this study do not permit the estimation of rates nor the statistical comparison of rates and proportions, some potentially important observations can be made from these data. Perhaps the most important of these is the inter-regional differences in the numbers of perinatal and neonatal deaths detected: despite the facts that the same methods were utilized to detect such deaths in the three regions, that in the more culturally and politically isolated highlands the available records are believed to be less complete than in the other two regions, and that the field investigators belonged to the same Ladino ethnic and cultural group as the majority of the populations in the South Coast and Oriente regions (whereas they were culturally and linguistically more distinct from the predominantly indigenous Maya population of the Highland region), in the Highland region there is a strikingly greater number of perinatal and neonatal deaths detected in relation to the total number of births studied.

Given the limitations of study methodology, perhaps the most valid comparisons among the three regions are provided by examination of the ratios of the censused populations of the municipalities studied, comparing these ratios with the ratios of perinatal and neonatal deaths in the same municipalities. The first comparison reveals that, in relation to the total census population of the four South Coast municipalities studied, the total population of the Oriente communities was 1.12 times greater, and the total population of the Highland communities was 2.34 times greater. Comparing the numbers of perinatal (intrapartum/day one) and neonatal (after day one) deaths identified from all sources in the same populations reveals that in relation to the South Coast municipalities, the Oriente communities had a

number of such deaths that was only 0.38 that of the South Coast, and the Highlands had a number of such deaths that was 9.88 times as great.

Despite methodological considerations, these differences are strongly indicative of regional differences in rates of perinatal and neonatal mortality, with the Mayan Highlands appearing to experience a much greater burden of such mortality.

A related finding emerged from comparison of the ratios of identified perinatal and neonatal deaths to identified total births among the population segments living within and outside the 30 minute distance from municipal centers in the three regions. In the Oriente region, perinatal and neonatal deaths were detected almost exclusively outside the 30 minute radius (that is farther away from health services). In the South Coast, the majority of deaths also occurred outside the 30 minute radius, although a slightly larger proportion of total deaths than in the Oriente region occurred within that radius (closer to health services). In the Highlands, the 30 minute radius made essentially no difference: the proportion of all identified births that were perinatal or neonatal deaths was identical regardless of whether the household was located close to or distant from health services available in the municipality. This finding invites further investigation of the functional determinants of the relation of health services to health outcomes in Guatemala.

Turning to the subject of oxytocin use, the findings in the various communities studied are presented in Table 3. It was found that while many mothers who reported receiving injections could name the substance injected ("Sintocinon"), a substantial number of mothers could not identify the specific substance. Therefore, these two categories of response are reported separately.

These data are presented in detail to demonstrate one important point about the use of oxytocin (and "other or unknown" injections, at least some of which probably represent oxytocin): there is wide variability by location in such reported use. The overall proportions of births studied in which oxytocin was reported ranges from zero (in 4 of 11 Highland communities, 1 of 4 South Coast communities, and 3 of 5 Oriente communities) to 36% (in the highland community of Alotenango, which interestingly lies in the same district as the INCAP study community Santa Maria de Jesus). The determinants of this variability were not identified by this study, and may not be able to be identified easily. This variability may represent the practice of one or a few birth attendants or of the community of birth attendants in a given locale. It may also represent the influence of a particular pharmacist or other supplier, or access to such a supplier or practice in a neighboring area.

There is a suggestion that, in regards to the Highlands (where the use of oxytocin appears to be most common), proximity to urban areas is associated with increased use of injections during labor: like the original INCAP study of Santa Maria de Jesus, the municipalities of Alotenango and Santiago have easy access to Guatemala City, while several other municipalities with relatively high rates of injection during labor (San Antonio, San Bartolo) lie close to Quetzaltenango, one of Guatemala's largest cities outside the capital.

Table 3: Reported use of oxytocin and "other/unknown" injections during labor, by region, municipality, and birth outcome.

(# in category/ # + oxytocin/# + "other or unknown" injection)

<u>Region/</u>	<u>Intrapartum/</u>		
<u>Municipality</u>	<u>Controls</u>	<u>Day One Deaths</u>	<u>Neonatal Deaths</u>
<u>Highlands:</u>			
Alotenango	24/9[38%]/0	8/4[50%]/0	4/0/0
El Chinique	44/0/2[4%]	3/0/0	2/0/0
El Chol	20/0/0	0/-/-	0/-/-
Sn. Antonio	37/0/18[49%]	0/-/-	2/0/2[100%]
Sn. Bartolo	39/9[23%]/0	1/1[100%]/0	0/-/-
Sn. Jeronimo	33/0/0	2/0/0	3/0/0
Sn. Pedro Lag.	95/2[2%]/4[4%]	7/0/0	1/0/0
Sta. Ana Huistra	37/2[5%]/0	1/0/0	0/-/-
Sta. Apolonia	51/3[6%]/1[2%]	10/1[10%]/1[10%]	3/0/0
Sta. Cruz Bal.	77/10[13%]/1[1%]	3/0/0	3/1[33%]/0
Santiago Sac.	31/8[26%]/0	26/6[23%]/0	0/-/-
<u>South Coast:</u>			
Guazacapan	113/5[4%]/22%	1/0/0	3/0/0
Iztapa	51/0/1[2%]	0/-/-	0/-/-
Sn. Jose Idolo	60/2[3%]/4[7%]	2/0/0	1/0/0
Sn. Lorenzo	71/11%]/1[1%]	5/0/0	1/0/0
<u>Oriente:</u>			
Cabanas	57/0/0	1/0/0	0/-/-
Estanzuela	69/0/0	0/-/-	0/-/-
Sn. Jose Anada	25/0/0	0/-/-	0/-/-
Sansare	41/1[2%]/0	1/0/0	0/-/-
Usumatlan	48/2[4%]/0	1/0/0	0/-/-

Regional differences also appear to emerge from these data. The data are summarized in regional totals in Table 4.

Table 4: Reported use of oxytocin and "other/unknown" injections during labor, by region and birth outcome.			
<u>Region</u>	<u>Number</u>	<u>% + Oxytocin</u>	<u>% + "Other/Unknown" Injection</u>
<u>Highlands:</u>			
Controls	488	9%	5%
IP/Day 1 Deaths	61	20%	2%
Neonatal Deaths	18	6%	11%
<u>South Coast:</u>			
Controls	295	3%	3%
IP/Day 1 Deaths	8	0%	0%
Neonatal Deaths	5	0%	0%
<u>Oriente:</u>			
Controls	240	1%	0%
IP/Day 1 Deaths	3	0%	0%
Neonatal Deaths	0	-	-

Again, recognizing that the study design does not permit valid statistical comparison of rates and proportions, it is noted that in the Highlands, where the greatest use of oxytocin appears to be documented, there does appear to be a greater use of this injection in the identified cases of intrapartum and day one infant death than in the control births or in the cases of infants dying later in the neonatal period. A substantially greater use of oxytocin and other or unknown injections during labor in the Highlands, in comparison with the other regions, also emerges from these data.

V. CONCLUSIONS

This study suggests the following conclusions:

1. The use of oxytocin by intramuscular injection appears to exist in rural municipalities of Guatemala other than that in which the original observation was made by INCAP investigators.
2. The use of this injection by birth attendants appears to be greatest in the indigenous Maya population of the Highlands region, although it appears in other regions as well.
3. There appears to be substantial variability among municipalities in the rate at which this practice occurs; the determinants of this variability are not determined.
4. The burden of perinatal and neonatal deaths appears to be substantially greater in the indigenous population of the Highlands than in the other regions studied.

The findings of this study must be considered in the light of the other pieces of information and knowledge regarding oxytocin and its use in the Guatemalan context. Added to the substantial body of clinical experience with the obstetric use of oxytocin and its consequences, and to the findings in more focused and controlled studies of significantly increased risk of birth-related perinatal mortality when intramuscular oxytocin was administered by birth attendants, this study substantiates the need to control the use of this product during birth assistance in Guatemala.

Doing so may require multiple intervention approaches. Effective education of birth attendants in the dangers of oxytocin use and the reasons for its proscription should certainly be part of such intervention; this education should ideally be provided in the context of practical, problem-oriented training and support for these birth attendants. Supervision (for example, by review of cases of perinatal mortality and a sample of all births occurring in communities) and disciplinary enforcement of this proscription are also likely to be needed to reinforce this teaching.

However, existing information indicates that other interventions may likely be required as well. These may include review of the sources by which oxytocin and other inappropriate pharmaceutical products reach rural communities, with identification and more effective regulation of local channels such as individual pharmacies and other potential suppliers. The appearance of a single product throughout the country suggests that inquiry might appropriately be made into the marketing and distribution approaches of the regional manufacturer and distributor of that product. Examination of the patterns of use, and teaching related to use, of oxytocin in public and private hospitals and clinics may also be indicated, since these sites of "modern" medicine frequently serve as the principal sources of beliefs and practices among more peripheral health and paramedical workers.

Given the high rates of perinatal and neonatal mortality already documented in Guatemala, an effort to control inappropriate use of oxytocin should be carried out in the context of a broader effort to improve the quality of prenatal, labor and delivery, and post-partum and neonatal care for Guatemalan women and their infants.

REFERENCES

1. Wrigley A.J. The place of oxytocic drugs before the birth of the child. *J Obstetr Gynecol Brit Emp*, 1959 (Oct);66:857-9
2. Moir J.C. Discussion on the place of oxytocic drugs before the birth of the child. *J Obstetr Gynecol Brit Emp*, 1959 (Oct);66:860-2.
3. Garnet J.D. Uterine rupture during pregnancy - An analysis of 133 patients. *Obstetr Gynecol*, 1964;23:898-905.
4. Favier J., Helfferich M. The effects on the fetus of an abnormal contraction pattern in the induction of labor with oxytocin. *Am J Obstetr Gynecol*, 1972;112:1107-11.
5. Liston W.A., Campbell A.J. Dangers of oxytocin-induced labour to fetuses. *Br Med J*, 1974;3:606-7.
6. Hess O.W., Hon E.H. The electronic evaluation of fetal heart rate - III. The effect of an oxytocic agent used for the induction of labor. *Am J Obstetr Gynecol*, 1960;80:558-68.
7. Brinsmead M. Fetal and neonatal effects of drugs administered in labour. *Med J Australia*, 1987;146:481-6.
8. Bartlett A.V., de Bocaletti M.E.P. Intrapartum and neonatal mortality in a traditional indigenous community in rural Guatemala. *Acta Paediatr Scand*, 1991;80:288-96.