The Census-Based, Impact-Oriented Approach and Its Application by Andean Rural Health Care in Bolivia, South America

Volume III

Appendix

VOLUME III.

APPENDIX

APPENDIX CONTENTS

APPENDIX I. Methodology

Most of the data, qualitative and quantitative, were collected during two trips to Bolivia in January/February and in May, 1993. Considerable information had been collected at the Lake Junaluska office and at various locations in Bolivia, but it had not been centralized and converted into a computer-readable format. Previously conducted evaluations were reviewed and appropriate data extracted from them.

During the January/February trip, field staff were interviewed regarding the day-to-day functioning of program operations and their views regarding the CBIO approach. The birth and death registration data were collected during this trip. The May trip was devoted primarily to collecting information for the case-control studies and also additional information for the cost analysis.

The following pages contain examples of forms which were used to abstract quantitative information from the program monthly reports, from the birth and death registries, and from financial reports. This information was then analyzed using EPI INFO version 5.0 software.

It was necessary to develop a death codification scheme. This is attached. When more than one diagnosis was encountered in the death registry, both were recorded for further analysis. Cause of death was assigned by one of the program staff, often in discussion with the program director, after interviews with the family. No formal verbal autopsy protocol was used. The person assigning the cause of death was in all cases a trained member of the program staff.

EXAMPLE OF FORM USED TO RECORD HEALTH ACTIVITES AT PROGRAM SITES
(for EPI INFO)

SISTEMA DE INFORMACION DE SALUD
CARABUCO

1. Fecha de informe {fechainf} <dd/mm/yy>

2. Numero de consultas y otros servicios curativos

número de consultas nuevas menos de 5 años	{numcnn} ###
número de consultas nuevas 5 años y mas	{numcnm} ###
numero total de consultas nuevas	{tconnue} ###
número de consultas repetidas menos de 5 años	{numcrn} ###
número de consultas repetidas 5 años y mas	{numcrm} ###
numero total de consultas repetidas	{tconrep} ###
número de consultas menos de 5 años referidas	{numcnr} ###
número de consultas 5 años y mas referidas	{numcmr} ###
numero total de consultas referidas	{tconref} ###
número de consultas en total	{numcont} ###

número de inyectables {numiny} ###
número de venoclisis {numven} ###
número de suturas {numsut} ###
número de curaciones {numcur} ###

3. Número de visitas domiciliarias {numvd} ####

4. Participación Comunitaria

número de reuniones con clubes de madres	{numreucl} ###
número de participantes	{parreucl} ###
número de reuniones con la comunidad	{numreuco} ###
número de participantes	{parreuco} ###
número de reuniones con autoridades	{numreuau} ###
número de participantes	{parreuau} ###
número de reuniones con escuelas	{numreues} ###
número de participantes	{parreues} ###

5. Número de vacunas por grupo etareo

polio 1 menos de un año {OPV1a} ###
polio 1 1-4 años {OPV1b} ###
polio 2 menos de un año {OPV2a} ###
polio 2 1-4 años {OPV2b} ###
polio 3 menos de un año {OPV3a} ###
polio 3 1-4 años {OPV3b} ###
polio refuerzo menos de un año {OPVRa} ###
polio refuerzo 1-4 años {OPVRb} ###

DPT 1 menos de un año {DPT1a} ###
DPT 1 1-4 años {DPT1b} ###
DPT 2 menos de un año {DPT2a} ###
DPT 2 1-4 años {DPT2b} ###
DPT 3 menos de un año {DPT3a} ###
DPT 3 1-4 años {DPT3b} ###

sarampión menos de un año {SARAMPa} ###
sarampión 1-4 años {SARAMPb} ###

BCG menos de 1 año {BCGa} ###
BCG 1-4 años {BCGb} ###

toxoide tétanico,
primer dosis {TT1} ###
segundo dosis {TT2} ###
tercer dosis (o mas) {TT3} ###

6. Actividades en Nutrición

número de niños en total (menos de 5 años) recibiendo control de crecimiento {numcc} ###

número de niños nuevos menos de dos años en control nutricional {nnncn} ###

número de niños repitidos menos de dos años en control nutricional {nnrcn} ###

número de niños menos de dos años con lana roja {nnlr} ###

número de niños menos de dos años con lana amarilla {nnla} ###

número de niños menos de dos años con lana verde
{nnlv} ###

número de niños de 2 - 4 años en control nutricional
{nnmcn} ###

7. Número de casos de diarrea tratado en niños menos de 5 años:

número total de niños tratado con diarrea {numtodia} ###

sin deshidritación {numdiars} ###
con deshidritación {numdiarc} ###

número de casos en niños menos de un año {numdiinf} ###
número de casos en niños 1 - 4 anos {numdinin} ###

número do niños menos de dos años con signos de
deshidritación {diamen2d} ###
número de niños 2-4 años con signos de
deshidritación {diamas2d} ###

8. Número de casos de infección respiratoria aguda tratado en niños menos de 5 años:

número total de niños tratado con IRA {numtoIRA} ###
no neumonía {neum1} ###
oidos y gargantas {neum2} ###
neumonía moderado {neum3} ###
neumonía grave {neum4} ###

número de casos en niños menos de un año {numneinf} ###
número de casos en niños 1 - 4 anos {numnenin} ###

número de casos de IRA con nuemonía en niños menos de
2 años {neume2} ###
número de casos de IRA con nuemonía en niños 2-4
años {neuma2} ###

9. Atención obstetrica

controles prenatales
primer control {primconpr} ###
segundo control {segconpr} ###
número total de controles {numconto} ###

partos
parto a domicilio {partodom} ###
parto institucional {partoins} ###
número total de partos {numparto} ###

control puerperio
fisiologico {conpuefi} ###
patológico {conpuepa} ###
numero totales de controles puerperios {numpueto} ###

10. Programa de tuberculosis

número de pacientes en
tratamiento al inicio
del mes (antiguos) {TBantig} ###

PACIENTES INCORPORADOS EN EL MES
número de pacientes nuevos {TBnuev} ###
número de pacientes reingresados {TBantig} ###
número de pacientes transferidos {TBreing} ###
número total de pacientes
incorporados {TBincor} ###

PACIENTES EGRESADOS EN EL MES
número de pacientes curados {TBcur} ###
número de pacientes que
abandonó su tratamiento {TBaban} ###
número de pacientes transferidos {TBtrans} ###
número de pacientes que murió {TBmurio} ###
número de fracasos terapeuticos {TBfrac} ###
número total de egresados {TBegres} ###

PACIENTES CONTINUANDO SU TRATAMIENTO {TBcon} ###

11. Examenes del laboratorio

total examenes del laboratorio {tel} ###

12. Servicios de Odontología

número de consultas nuevas {ncon} ###
número de consultas repetidas {ncor} ###
número de consultas en total {ncot} ###

Anotaciones

1. Si dice neumonía leve, se puede notar como "no neumonía."
2. Antes de Enero, 1990, el numero de las IRAs es para los grupos etareos menos de 15 años, no solamente los menos de 5 años.
3. Antes de Enero, 1990,el numero de las diarreas es para los grupos etareos menos de 15 años, no solamente para los que son menos de 5 años.
4. Los datos por Diciembre, 1983, son para el período de tres meses, del 16 de Septiembre, 1983, hasta ed 16 de Diciembre, 1983.
5. Los datos para vacunas para Diciembre, 1986, son para el año de 1 de Enero, 1986, hasta el 31 de Diciembre, 1986.
6. Los datos para vacunas para Diciembre, 1987, son para el año de 1 de Enero, 1987, hasta el 31 de Diciembre, 1987.
7. Los datos para vacunas para Septiembre, 1985, son para tres meses (Junio hasta Septiembre, 1985).

CBIO APPROACH Appendix I.

EXAMPLE OF FORM USED TO RECORD BIRTHS

Registro de Nacimientos

Programa de Salud, Villa Cochabamba/Montero

Consejo de Salud Rural Andino

1. nombre de niño que nació

   {nombre} _____

2. dirección

   barrio {barrio} _____

   codigo para el nombre del barrio {codbar} ##
   manzana {mans} ###
   numero de vivienda {numviv} ###.#

3. fecha de nacimiento {fechanac} <dd/mm/yy>

4. sexo {sexo} _ (m o f)

5. ubicación del parto {ubicpar} (d=domiciliario)
   (h=hospital)

6. peso al nacer {pesonac} ##.### kilogramas

7. fechas de vacunas puesto al nacer

   BCG {BCG} <dd/mm/yy>
   polio 1 {polio1} <dd/mm/yy>

Guía Para el Uso del Questionario

2. Communidad

Codigo para los barrios:

Villa Cochabamba....1
Barrio San Jose.....2
Villa Verde.........3
Villa Barrientos....4
Pampa de la Madre...5
Villa Virginia......6
Barrio Porvenir.....7
Barrio Fabril.......8

2. Numero de la casa:

Si el número de la familia es 1, el número de la vivienda es xx.1. Entonces, el número de la vivienda 49, familia 2 debe entrar la sistema de información como 49.2.

3. Fecha de nacimiento:

Si tiene el año no mas, ponga 01/06/xx.

4. Sexo:

masculino- "m"
femenino- "f"

EXAMPLE OF FORM USED TO RECORD DEATHS

Registro de Muertes

Programa de Salud, Carabuco

Consejo de Salud Rural Andino

1. nombre de persona que murió

   {nombre} _____

2. communidad

   {commun} _____

   codigo para el nombre de la comunidad {codcom} ##

   número de casa ###.#

3. fecha de nacimiento {fechanac} <dd/mm/yy>

4. sexo {sexo} _ (m o f)

5. fecha de muerte {fechamue} <dd/mm/yy>

6. edad al morir

edad al morir en años	{edadmora} ###.## anos
edad al morir en meses	{edadmorm} ###.## meses
edad al morir en semanas	{edadmors} ###.## semanas
edad al morir en dias	{edadmord} ###.## dias

7. causa de muerte

{caumuert} _____

codigo 1 de causa de muerte {codmuer1} ####
codigo 2 de causa de muerte {codmuer2} ####
codigo 3 de causa de muerte {codmuer3} ####
codigo 4 de causa de muerte {codmuer4} ####
codigo 5 de causa de muerte {codmuer5} ####

8. hallazgos de autopsia verbal

autopsia hecho {authech} __ (si o no)

{autverb} _____
_____
_____

Guía Para el Uso del Cuestionario

2. Communidad

Codigo para las comunidades:

Aguas Calientes.....1
Cacachi.....2
Cavinchilla.....3
Chaguaya.....4
Challapata Belen....5
Challapata Grande...6
Centro Putina.....7
Cojatapampa.....8
Huajasia.....9
Huancatapi.....10
Jokopampa.....11
Karkapunco.....12
Marcahilata.....13
Mermapata.....14
Mollipongo.....15
Ollasjantia.....16
Omacuyo.....17
Quiascapa.....18
Quilima.....19
Quirihuati.....20
Sacuco.....21
Santiago de Okola..22
Sañuta.....23
Sayuapampa.....24
Sisasani.....25
Tilacoca.....26
Villa Cojata.....27
Villa Karcuyo.....33
Villa Molino.....29
Yaricoa Alto.....30
Yaricoa Bajo.....31
Mollipongo A.....32
Mollipongo B.....33
Huayñacota.....32

Número de la casa:

Si el número tiene tambien un "A" o "B,"
ponga en lugar de "A" un "1" y en lugar de "B" un 2.
Entonces, el número de la casa de 49.B debe entrar la
sistema de información como 49.2.

3. Fecha de nacimiento:

   Si tiene el año no mas, ponga 01/06/xx.

4. Sexo:

   masculino- "m"
   femenino- "f"

4. Fecha de muerte:

   Si tiene el año no mas, ponga 01/06/xx.
   Si tiene el año y mes pero no el día, ponga 15/xx/xx.

FORM USED TO COLLECT FINANCIAL INFORMATION FOR PROGRAM AREAS

Questionario Sobre Costos y Ingresos

1. Nombre del Programa: {nombprog}_____

   código del programa: {codprog} ##

2. fecha del informe: {fechainf} <dd/mm/yy>

   período del informe: de {perpri} <dd/mm/yy> a {perfin} <dd/mm/yy>

3. gastos de inversión

   a. infraestructura

suministros y materiales para construcción relacionado al programa de salud (5400)	{sm5400}	$######
suministros y materiales para construcción relacionado al desarrollo comunitario	{smcrdc}	$######
suministros y materiales para construcción relacionado al agua y saneamiento	{smcras}	$######

   b. transporte

compra de vehículos (5140) (incluye compra de motos)	{cv5140}	$######

   c. equipos

equipo de oficina (5100)	{eo5100}	$######
equipo de educación (5120)	{ee5120}	$######
equipo de comunicación (5130)	{ec5130}	$######
equipo medico (5110) (incluye equipo dental y equipo del laboratorio)	{em5110}	$######

gasto total de inversión	{gtinv}	$######

4. gastos recurrentes

a. personal		
salarios (5200)	{s5200}	$######
beneficios sociales (5210)	{bs5210}	$######
gasto total de personal	{gtper}	$######
b. consultores		
consultores locales (5510)	{cl5510}	$######
consultores del exterior (5520)	{ce5520}	$######
contratos (5540)	{c5540}	$######
gasto total de consultores	{gtcon}	$######
c. suministros		
c.1. suministros para atención en salud		
suministros y materiales supervivencia infantil (5410)	{smsi5410}	$######
medicinas (5420)	{m5420}	$######
suministros medicos (5425)	{sm5425}	$######
suministros dentales (5430)	{sd5430}	$######
suministros del laboratorio (5440)	{sl5440}	$######
incentivos a voluntarios (5465)	{sv5465}	$######
gasto total de suministros para atención en salud	{gtspas}	$######
c.2. suministros para apoyar el programa		
fotografías (5580)	{f5580}	$######
libros, publicaciones, y subscripciones (5590)	{lps5590}	$######
cuotas a asociaciones (5595)	{ca5595}	$######
suministros y materiales de oficina (5740)	{smo5740}	$######
suministros y materiales del campo (5745)	{smc5745}	$######
uniformes (5865)	{u5865}	$######
gasto total de suministros para apoyar el programa	{gtspap}	$######

d. gastos de servicios directos		
subvención de pacientes indigentes (5570)	{spi5570}	$######
relaciónes con la comunidad (5780)	{rcc5780}	$######
gasto total de servicios directos	{gtsd}	$######
e. gastos administrativos (no personal)		
gastos legales/ formularios (5750)	{glf5750}	$######
servicio teléfono (5760)	{st5760}	$######
correo (5765)	{c5765}	$######
radio comunicaciónes (5770)	{rc5770}	$######
fotocopias (5775)	{f5775}	$######
impresión (5739)	{i5739}	$######
reuniónes de directorio (5790)	{rd5790}	$######
reclutamiento personal (5795)	{rp5795}	$######
agua y luz (5800)	{al5800}	$######
seguros (5810)	{s5810}	$######
intereses (5820)	{i5820}	$######
cargos bancarios (5825)	{cb5825}	$######
impuestos sobre ventas (5830)	{isv5830}	$######
servicios de té y refrigerios (5850)	{str5850}	$######
traducciones (5855)	{t5855}	$######
lavandería (5860)	{l5860}	$######
vario	{miscel}	$######
gasto total de administración (no personal)	{gtanp}	$######
f. gastos de viaje		
transporte local (5300)	{tl5300}	$######
transporte interior (5310)	{ti5310}	$######
viaticos en el país (5320)	{vp5320}	$######
gasto total de viaje	{gtv}	$######
g. transporte		
uso y mantenimiento de vehiculos (5720)	{umv5720}	$######
depreciación de vehículos	{dv}	$######
gasto total de transporte	{gttran}	$######

h. capacitación		
reuniones nacionales (5550)	{rn5550}	$######
matrícula seminarios (5560)	{ms5560}	$######
materiales de entrenamiento para el personal (5450)	{mepp5450}	$######
materiales de entrenamiento para voluntarios (5460)	{mepv5460}	$######
materiales educativos (5470)	{me5470}	$######
diseño de materiales educativos (5475)	{dme5475}	$######
materiales audiovisuales (5480)	{ma5480}	$######
educación radial (5485)	{er5485}	$######
curso de capacitación al personal	{cucapp}	$######
capacitación de voluntarios	{capvol}	$######
gasto total de capacitación	{gtcap}	$######
j. mantenimiento de equipo e infraestructura		
mantenimiento de equipos (5705)	{me5705}	$######
mantenimiento edificios (5715)	{me5715}	$######
alquiler de equipos (5700)	{ae5700}	$######
mantenimiento de computador (5730)	{mc5730}	$######
alquiler de edificios (5710)	{ae5710}	$######
depreciación (no incluyendo vehiculos) (5840)	{dniv5840}	$######
gasto total de mantenimiento	{gtmant}	$######
k. desarrollo comunitario		
desarrollo comunitario aparte del programa de salud	{dcaps}	$######
l. evaluación		
auditoría (5500)	{a5500}	$######
evaluación	{eval}	$######
gasto total del evaluación	{gteval}	$######
GASTO TOTAL DEL PERIOD	{gtper}	$######

INGRESOS

Fuentes de Ingresos

USAID (incluyendo PROCOSI)	{USAID}	$######
otros donaciónes	{od}	$######
CSRA	{CSRA}	$######
MPSSP	{MPSSP}	$######
locales	{l}	$######
INGRESOS TOTALES	{ingtot}	$######

NOTAS: _____

Anotaciones Sobre el Cuestionario

código del programa:

1. Carabuco..... 01
2. Ancoraimes..... 02
3. Mallco Rancho..... 03
4. Sipe Sipe..... 04
5. Villa Cochabamba/Montero... 05

todos los costos deben ser asignado a uno de tres categorías:
dedicado al supervivencia infantil
dedicado al atención primaria
dedicado al desarrollo fuera de salud

CODING CLASSIFICATION FOR CAUSE OF DEATH

Clasificación de Causas de Muertes

CLASIFICACION	CODIGO
01 infeciones respiratorias	
01 infección respiratoria aguda (IRA) (incluye "neumonía," " tos," "tos seca" en niños, "neumopatía," "pulmonía," y bronconuemonía)	0101
02 tuberculosis (incluye "hemoptysis," tuberculosis pulmonar)	0102
03 asfixia (incluye "dificultad respiratoria")	0103
04 enfermedad pulmonar	0104
05 coqueluche	0105
02 infecciones gatrointestinales	
01 diarrea (incluye "vomitos y diarrea," "gastroenteritis," "deshidratación," "enterocolitis," "infeción gastrointestinal")	0201
02 colera	0202
03 salmonella	0203
04 hepatitis	0204
05 disenteria	0205

03 otros infecciones	
01 sarampión	0301
02 tétano (no neonatal)	0302
03 omfalitis	0303
04 septicemia	0304
05 meningitis	0305
06 fiebre	0306
07 tuberculosis extrapulmonar (incluye tuberculosis renal)	0307
08 osteomielitis	0308
09 abceso	0309
10 rabia humana	0310
04 enfermedades obstetricos	
01 retención de placenta	0401
02 hemorragia vaginal (en mujer embarazada)	0402
03 obstrucción de parto	0403
04 infección puerperal	0404
05 desprendimiento de placenta	0405
06 eclampsia	0406
07 otra enfermedad obstetrica (incluye "complicación de embarazo no especificado"	0407

05 enfermedades perinatales

01 anomolia congenita	0501
02 asfixia neonatal	0502
03 mortinato (muerte del feto durante el trabajo de parto o al momento antes de dar luz)	0503
04 obito (muerte de feto intrauterino antes de empezar el trabajo de parto)	0504
05 nacio muerte (no se puede distinguir si fue mortinato u obito)	0505
06 prematuro	0506
07 pie zambo	0507
08 desnutrición intrauterina (incluye nacidos de bajo peso)	0508
09 hidrocefalico	0509
10 sepsis neonatal	0510
11 sufrimiento fetal por parto prolongado	0511
12 laporino	0512
13 tetano neonatal	0513

06 accidente/trauma

01 ahogado (incluye "asfixia en agua," "accidente fluvial")	0601
02 intoxicación alcohólico (borracho)	0602
03 accidente	0603
04 relampago	0604
05 accidente electrico	0605
06 accidente del transito (incluye "accidente de transporte")	0606
07 accidente con animal	0607
08 asfixia en cama	0608
09 suicídio	0609
10 envenamiento (incluye intoxicación)	0610
11 intoxicación accidental	0611
12 intoxicación química (incluye intoxicación con insecticida)	0612
13 traumatismo (incluye "politraumatismo," "trauma")	0613
14 tóxico	0614
15 descuido de los padres (incluye "padre borracho," o "madre borracha")	0615
16 trauma encefalocranial (TEC)	0616
17 accidente con arma de fuego	0617
18 quemadura	0618
19 ahorcado	0619

07 enfermedades nutricionales

01 desnutrición	0701
02 anorexia	0702

08 enferemdades abdominales

01 abdomen agudo	0801
02 apendicitis	0802
03 ascitis	0803
04 colicistitis (incluye "vesicula," "vesicula biliar," calculo biliar)	0804
05 dolor del estomago (incluye "dolor abdominal," "gastritis," "enfermedad del estomago")	0805
06 hemorragia interna	0806
07 esofagitis	0807
08 obstrucción intestinal (incluye empacho)	0808
09 ulcera peptica (incluye "ulcera en el estomago," y "ulcera hepatica")	0809
10 volvulo	0810
11 pancreatitis	0811
12 cólico	0812
13 hemorragia digestiva alta	0813
14 vomitos (sin otro sintome digestiva)	0814

09 enfermedades cardiacos

01	ataque cardiaco (incluye "paro cardiaco")	0901
02	insuficiencia cardiaca (incluye "cardiopatía," "insuficiencia cardiorespiratoria," "mal de corazon)"	0902
03	edema pulmonar	0903

10 enfermedades musquelatales

01	articulaciones hinchadas	1001
02	reumatismo (incluye artritis reumatica)	1002

11 enfermedades neurológicos

01	accidente cerebrovascular (incluye "embolia," "aire")	1101
02	epilepsia	1102
03	tumor cerebral	1103
04	paralítico (incluye paralisis)	1104
05	secuela de meningitis	1105
06	dolor de la cabeza	1106

12 desordenes hematológicos

01	anemia	1201
02	epistaxis	1202
03	purpura	1203
04	discracia sanguinea	1204
05	linfoma maligna (incluye "leucemia")	1205
06	adenopatía aguda	1206

13 vejez

01 vejez (incluye "edad avanzado," "edad," "senectud")	1301

14 diagnoses tradicionales

01 ajayu	1401
02 caricari	1402
03 coleron (incluye "colerina")	1403
04 susto	1404
05 animo	1405
06 curme	1406
07 arrabato	1407
08 tiricia	1408

15 complicaciones postoperatorio

01 muerte postoperatorio	1501

16 enfermedades respiratorios (no incluye infecciones repiratorias agudas ni TB)

01 asma	1601
02 bronquoaspiración	1602
03 bronquitis cronica	1603
04 obstrucción respiratorio (incluye "cuerpo extraño en la laringe")	1604
05 tos cronico (incluye tos seca en adultos)	1605

17 desordenes varios

01	edema generalizada	1701
02	flatulencia	1702
03	sarcoptosis (incluye "karachi")	1703
04	alergia	1704

18 cancer no especificado en otro categoría

01	hemorragia vaginal (en mujer de edad avanzada o no embarazada)	1801
02	liposarcoma	1802
03	tumor maligno (incluye "cancer")	1803
04	cancer del higado	1804
05	cancer en los testiculos	1805
06	cancer de la mama	1806
07	cancer de paladar	1807

19 enfermedades genitourinarias

01	glomerulonefritis	1901
02	insuficiencia renal (incluye "insuficiencia hepatorenal")	1902
03	infección urinario	1903
04	problema urinario	1904

20 desconocido

01	desconocido (incluye "se ignora")	2001

21 desordenes endocrinológicos

01	diabetes	2101

APPENDIX II. Staff of ARHC's Established Health Programs in Carabuco, Mallco Rancho, and Villa Cochabamba

STAFF OF THE CARABUCO HEALTH PROGRAM

1983-1992

Carabuco Program Staff, 1983-1992

1983

Dr. Aida Quintanilla-	physician
Dr. Henry Perry (part-time)-	physician
Sister Mary Elko-	graduate nurse
Gloria Laime-	accountant (La Paz office)

1984

Dr. Mirta Morfini-	Director

Carabuco Program Staff, 1983-1992
(continued)

1985

Dr. Fernando Acha-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Ms. Vicky Barron de Zayez-	auxiliary nurse
Ms. Jorge Zayez-	driver
Mr. Clemente Fernandez-	groundskeeper
Mr. Ernesto Mendizabal-	administrator (La Paz office)
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

1986

Dr. Fernando Acha-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Ms. Vicky Barron de Zayez-	auxiliary nurse
Ms. Jorge Zayez-	driver
Mr. Clemente Fernandez-	groundskeeper
Mr. Ernesto Mendizabal-	administrator (La Paz office)
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

Carabuco Program Staff, 1983-1992
(continued)

1987

Dr. Fernando Acha-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Mr. Hernando Quelali-	auxiliary nurse
Mr. Pablo Siñani-	auxiliary nurse
Mr. Sixto Cancari-	driver
Mr. Clemente Fernandez-	groundskeeper
Mr. Ernesto Mendizabal-	administrator (La Paz office)
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

1988

Dr. Ivan Gonzales-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Mr. Hernando Quelali-	auxiliary nurse
Mr. Pablo Siñani-	auxiliary nurse
Mr. Eustaquio Apaza-	community auxiliary nurse
Mr. Cruz Apaza-	community auxiliary nurse
Mr. Justino Condori-	community auxiliary nurse
Mr. Leonardo Magnani-	community auxiliary nurse
Mr. Ubaldo Quelali-	community auxiliary nurse
Mr. Joaquin Pacosillo-	community auxiliary nurse
Mr. Francisco Quispe-	community auxiliary nurse
Mr. Fermin Quispe-	community auxiliary nurse
Mr. Luciano Tintaya-	community auxiliary nurse
Mr. Angel Tintaya-	community auxiliary nurse
Mr. Ismael Yuque-	community auxiliary nurse
Mr. Sixto Cancari-	driver
Mr. Clemente Fernandez-	groundskeeper
Mr. Ernesto Mendizabal-	administrator (La Paz office)
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

Carabuco Program Staff, 1983-1992
(continued)

1989

Dr. Veronica Camarga-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Mr. Hernando Quelali-	auxiliary nurse
Mr. Pablo Siñani-	auxiliary nurse
Mr. Eustaquio Apaza-	community auxiliary nurse
Mr. Cruz Apaza-	community auxiliary nurse
Mr. Justino Condori-	community auxiliary nurse
Mr. Leonardo Magnani-	community auxiliary nurse
Mr. Ubaldo Quelali-	community auxiliary nurse
Mr. Joaquin Pacosillo-	community auxiliary nurse
Mr. Francisco Quispe-	community auxiliary nurse
Mr. Fermin Quispe-	community auxiliary nurse
Mr. Luciano Tintaya-	community auxiliary nurse
Mr. Angel Tintaya-	community auxiliary nurse
Mr. Ismael Yuque-	community auxiliary nurse
Mr. Sixto Cancari-	driver
Mr. Luis Pacosillo-	groundskeeper
Mr. Ernesto Mendizabal-	administrator (La Paz office)
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

Carabuco Program Staff, 1983-1992
(continued)

1990

Dr. Orlando Taja(part-time)-	Director
Dr. Veronica Camarga-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Mr. Hernando Quelali-	auxiliary nurse
Mr. Pablo Siñani-	auxiliary nurse
Mr. Eustaquio Apaza-	community auxiliary nurse
Mr. Cruz Apaza-	community auxiliary nurse
Mr. Justino Condori-	community auxiliary nurse
Mr. Leonardo Magnani-	community auxiliary nurse
Mr. Ubaldo Quelali-	community auxiliary nurse
Mr. Joaquin Pacosillo-	community auxiliary nurse
Mr. Francisco Quispe-	community auxiliary nurse
Mr. Fermin Quispe-	community auxiliary nurse
Mr. Luciano Tintaya-	community auxiliary nurse
Mr. Angel Tintaya-	community auxiliary nurse
Mr. Ismael Yuque-	community auxiliary nurse
Mr. Sixto Cancari-	driver
Mr. Luis Pacosillo-	groundskeeper
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

1991

Dr. Carolina Hilari-	Director
Dr. Dante Cariaga-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Mr. Hernando Quelali-	auxiliary nurse
Mr. Pablo Siñani-	auxiliary nurse
Mr. Cruz Apaza-	community auxiliary nurse
Mr. Justino Condori-	community auxiliary nurse
Mr. Leonardo Magnani-	community auxiliary nurse
Mr. Ubaldo Quelali-	community auxiliary nurse
Mr. Joaquin Pacosillo-	community auxiliary nurse
Mr. Francisco Quispe-	community auxiliary nurse
Mr. Fermin Quispe-	community auxiliary nurse
Mr. Luciano Tintaya-	community auxiliary nurse
Mr. Angel Tintaya-	community auxiliary nurse
Mr. Ismael Yuque-	community auxiliary nurse
Mr. Sixto Cancari-	driver

Carabuco Program Staff, 1983-1992
(continued)

1991 (continued)	
Mr. Luis Pacosillo-	groundskeeper
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)
1992	
Dr. Carolina Hilari-	Director
Dr. William Valencia-	MOH physician
Mr. Simon Saavedra-	rural health technician
Ms. Rosa Patiño-	rural health technician
Ms. Paolina Huanca	auxiliary based in Carabuco
Mr. Hernando Quelali-	auxiliary nurse
Mr. Pablo Siñani-	auxiliary nurse
Mr. Cruz Apaza-	community auxiliary nurse
Mr. Justino Condori-	community auxiliary nurse
Mr. Ubaldo Quelali-	community auxiliary nurse
Mr. Joaquin Pacosillo-	community auxiliary nurse
Mr. Francisco Quispe-	community auxiliary nurse
Mr. Fermin Quispe-	community auxiliary nurse
Mr. Luciano Tintaya-	community auxiliary nurse
Mr. Angel Tintaya-	community auxiliary nurse
Mr. Ismael Yuque-	community auxiliary nurse
Mr. Sixto Cancari-	driver
Mr. Luis Pacosillo-	groundskeeper
Ms. Gloria Laime-	accountant (La Paz office)
Mr. Jaime Cabrera-	supplies coordinator (La Paz office)
Mr. Javier Laura(part-time)-	office assistant (La Paz office)

STAFF OF THE MALLCO RANCHO HEALTH PROGRAM

1987-1992

Mallco Rancho Program Staff, 1987-1992

1987

Dr. Orlando Taja, Director (part-time)
Ms. Adela Asbun, Field Coordinator
Mr. Sabino Gabriel, rural health technician
Ms. Nelly Coronado, promotor
Ms. Fernando Montan, promotor
Mr. Rolando Guzman, administrator (Cochabamba)
Ms. Marta Quiruga, secretary (Cochabamba)

1988

Dr. Orlando Taja, Director (part-time)
Ms. Adela Asbun, Field Coordinator
Dr. Javier Rafael Arcos, physician
Ms. Marta Escobar, rural health technician
Ms. Nelly Coronado, promotor
Mr. Fernando Montan, promotor
Mr. Fuad Taja, field administrator
Mr. Rolando Guzman, adminstrator (Cochabamba)
Ms. Marta Quiruga, secretary (Cochabamba)
Mr. Moises Orellano, driver (Cochabamba)

1989

Dr. Orlando Taja, Director (part-time)
Ms. Adela Asbun, Field Coordinator
Dr. Edgar Fuentes, physician
Ms. Marta Escoabar, rural health technician
Mr. Fuad Taja, field administrator
Mr. Rolando Guzman, adminstrator (Cochabamba)
Ms. Carolina Mendoza, secretary (Cochabamba)
Mr. Milton Canedo, driver (Cochabamba)

Staff of the Mallco Rancho Health Program, 1987-1992
(continued)

1990

Dr. Orlando Taja, Director (part-time)
Ms. Adela Asbun, Field Coordinator
Dr. Gilka Lara, physician
Ms. Marta Escobar, rural health technician
Mr. Maclovio Mamani, rural health technician
Mr. Fuad Taja, field administrator
Dr. Pedro Vittorini, dentist
Ms. Catalina Ventura, auxiliary nurse
Mr. Fayez Mostafa, administrator (Quillacollo)
Mr. Ramiro Velasco, accountant (Quillacollo)
Ms. Carolina Mendoza, secretary (Quillacollo)
Mr. Gualberto Virrarroel, driver (Quillacollo)

1991

Dr. Orlando Taja, Director
Ms. Adela Asbun, Field Coordinator
Dr. Edgar Fuentes, physician
Ms. Marta Escobar, rural health technician
Mr. Maclovio Mamani, rural health technician
Mr. Luciano Cespedes, rural health technician
Ms. Nelly Coronado, auxiliary nurse
Ms. Maria Enojosa, auxiliary nurse
Mr. Fuad Taja, field administrator
Ms. Lucy Rojas, auxiliary statistician
Ms. Flora de Saavedra, cook
Dr. Patricia Camacho, dentist
Mr. Fayez Mostafa, adminstrator (Quillacollo)
Mr. Ramiro Velasco, accountant (Quillacollo)
Ms. Mary Morales, secretary (Quillacollo)
Mr. Mario Vargas, driver (Quillacollo)
Mr. Javier Saavedra, building maintenance (Quillacollo)

Staff of the Mallco Rancho Health Program, 1987-1992
(continued)

1992

Dr. Orlando Taja, Director
Ms. Adella Asbun, Field Coordinator
Dr. Roberto Flores, physician
Ms. Marta Escobar, rural health technician
Mr. Maclovio Mamani, rural health technician
Mr. Luciano Cespedes, rural health technician
Ms. Nelly Coronado, auxiliary nurse
Ms. Maria Enojosa, auxiliary nurse
Ms. Lucy Rojas, field administrator
Ms. Flora de Saavedra, cook
Dr. Miriam Casal, dentist
Mr. Fayez Mostafa, adminstrator (Quillacollo)
Mr. Ramiro Velasco, accountant (Quillacollo)
Ms. Mary Morales, secretary (Quillacollo)
Mr. Mario Vargas, driver (Quillacollo)
Mr. Javier Saavedra, building maintenance (Quillacollo)

STAFF OF THE VILLA COCHABAMBA/MONTERO HEALTH PROGRAM 1988-1992

Staff of the Villa Cochabamba Health Program, 1988-1992

1988

Dr. Dardo Chavez- Director (part-time)
Ms. Juana Zeballos- graduate nurse
Mr. Pedro Simone- statistician (part-time)

1989

Dr. Dardo Chavez- Director
Dr. Ramiro Bravo- physician
Ms. Juana Ceballos- graduate nurse
Mr. Pedro Simone- statistician (part-time)
Ms. Gloria Suarez- administrator
Ms. Corina Echeverría- auxiliary nurse
Mr. Edwin Claure- groundskeeper

1990

Dr. Dardo Chavez- Director
Dr. Ramiro Bravo- physician
Dr. Javier Baldomar- physician
Ms. Mitma de Chavez- graduate nurse
Ms. Teresa Ruíz- health promotor
Mr. Carlos Chavez- groundskeeper

1991

Dr. Dardo Chavez- Director
Dr. Javier Baldomar- physician
Dr. Walter Munoz- physician
Ms. Mitma de Chave- graduate nurse
Mr. Pedro Simone- statistician
Ms. Mirta Sanjines- administrator
Mr. Juan Carlos Guarabia- health technician
Mr. Edwin Claure- laboratory auxiliary
Ms. Sara Mercado- auxiliary nurse
Ms. Marta Heredia- auxiliary nurse
Ms. Teresa Ruíz- health promotor
Ms. Maria Esther Claros- health promotor
Mr. Carlos Chavez- groundskeeper

Staff of the Villa Cochabamba Health Program, 1988-1992
(continued)

1992

Dr. Dardo Chavez- Director
Dr. Javier Baldomar- physician
Dr. Maria Bravo- physician
Ms. Mitma Sanjines- administrator
Mr. Pedro Simone- statistician
Mr. Juan Carlos Guarabia- health technician
Ms. Olympia Maldonado- auxiliary nurse
Ms. Marta Heredia- auxiliary nurse
Ms. Inez Herbas- auxiliary nurse
Ms. Ester Andia- auxiliary nurse
Ms. Armanda Vargas- auxiliary nurse
Ms. Teresa Ruíz- health promotor
Ms. Silvia Pantoja- health promotor
Ms. Jacquelin Rosado- accountant (part-time)
Ms. Ana Maria Sosa- secretary

APPENDIX III. Additional Vaccination Coverage Data for Carabuco

Table 1.

DPT 3 Coverage in Carabuco, 1988-1992

type of assessment	date of assessment 1988	1989	1990	1992
percentage of children 12-23 months of age with complete vaccinations (css*)	57%	77%	86%	91%
percentage of children 12-23 months of age with complete vaccinations (rhpr*)	na	na	89%	88%
percentage of children 12-23 months of age with all vaccinations completed by 12 months of age (rhpr**)	na	64%	72%	69% (***)

* css: cluster sample survey
** rhpr: review of health post records
*** 7 communities were randomly selected for this analysis from the 31 communities in the area
na not assessed

Table 2.

OPV 3 Coverage in Carabuco, 1988-1992

type of assessment	date of assessment 1988	1989	1990	1992
percentage of children 12-23 months of age with complete vaccinations (css*)	57%	77%	86%	89%
percentage of children 12-23 months of age with complete vaccinations (rhpr*)	na	na	89%	88%
percentage of children 12-23 months of age with all vaccinations completed by 12 months of age (rhpr**)	na	64%	72%	69% (***)

* css: cluster sample survey
** rhpr: review of health post records
*** 7 communities were randomly selected for this analysis from the 31 communities in the area
na not assessed

Table 4.

BCG Coverage in Carabuco, 1988-1992

type of assessment	date of assessment 1988	1989	1990	1992
percentage of children 12-23 months of age with complete vaccinations (css*)	80%	93%	92%	97%
percentage of children 12-23 months of age with complete vaccinations (rhpr*)	na	na	92%	98%
percentage of children 12-23 months of age with all vaccinations completed by 12 months of age (rhpr**)	na	90%	89%	97% (***)

* css: cluster sample survey
** rhpr: review of health post records
*** 7 communities were randomly selected for this analysis from the 31 communities in the area
na not assessed

APPENDIX IV. DESCRIPTION AND FINDINGS OF THE CASE-CONTROL STUDIES OF INFANT AND CHILD DEATHS AT ARHC'S ESTABLISHED PROGRAM SITES

CASE-CONTROL STUDY OF INFANT DEATHS IN CARABUCO

METHODOLOGY

In May, 1993, the health post records were reviewed for those infants who had died in 1991 or 1992 and whose death had been registered in the Carabuco health information system. Only children who had died before their first birthday were included in the study.

Twenty-five infants were included, and their ages at death ranged from one hour to six months. Thus, there were no deaths encountered between seven and 12 months of age.

For each infant death identified, two controls were selected. A child qualified as a control if he or she lived in a nearby house and was born within six months (either before or after) of the child who died. The family folder for the house closest to the house of the child who died was first examined for the presence of a suitable control. If none was found, then the family folder for the next closest house was examined until a suitable control was encountered. Two control children were selected for each death. For the control children, information was abstracted relevant for that child up until the age at which the comparison child had died.

Information was abstracted from the family health folder for each child who died and for each of the two control children. The attached questionnaire was used for this purpose. This information was then computerized using EPI INFO software.

RESULTS

There were 25 infant deaths and 50 controls in this study. There was no significant difference between the two groups in terms of sex distribution.

The causes of death for the 25 children are shown in Table 1. Pneumonia and asphyxia accounted for almost one-half of the deaths. Diarrhea and malnutrition accounted for one-quarter, and neonatal causes, trauma, and unknown causes accounted for the remainder.

Table 1
Causes of Death Among Infants in Carabuco
Case-Control Study

cause of death	number	percent
pneumonia	6	24%
asphyxia	5	20%
neonatal causes*	4	16%
diarrhea	3	15%
malnutrition	2	10%
trauma	1	5%
unknown	4	16%
TOTAL	25	100%

* neonatal sepsis (2), prematurity with sepsis (1), fetal distress associated with prolonged labor (1).

Although this study was limited to children who died in Carabuco before their first birthday, it can be readily seen in Table 2 that most of the deaths were among very young infants. In fact, two-thirds of the deaths were among infants dying before completing their first month of life. Only one infant (4% of the cases) died between six and 12 months of age.

Table 2
Ages at Death of the 25 Cases Included in the Carabuco Case Control Study

Age	Number of Children	Percentage
less than 24 hrs	2	8%
1-3 days	1	4%
4-7 days	5	20%
8-14 days	4	16%
15-30 days	4	16%
1-<2 months	4	16%
2-<4 months	1	4%
4-<6 months	3	12%
6-<12 months	1	4%
TOTAL	25	100%

Nutrition

There was no significant difference between case and control children in the percentage who had growth charts. Birth weights were available for only two of the case children and seven of the control children. There were 34 children (cases and controls) weighed during the first month of life. Only two of these had their first weight recorded at less than 2.5 kilograms and six children had their first weight at less than 3.0 kilograms. There were no significant differences observed between case and control children in the numbers with low weights (defined either as less than 2.5 or 3.0 kilograms) during the first months of life.

There was no significant difference in the number of growth monitorings between the cases and the controls. The weight and height for each nutritional monitoring along with the date of the monitoring and the date of birth was used to calculate the percentile of height for age, weight for age, and weight for

height using EPI INFO nutritional software. These percentiles are based on the National Center for Health Statistics norms. There was no significant difference between cases and controls in the mean percentiles for these three nutritional indices for the first and second monitorings. There were so few children with three or more monitorings that comparisons between cases and controls were not meaningful. Only three case children and six control children had three or more monitorings. As noted previously, nutritional information was recorded for control children up until the ages at which the control child died.

Classifying children as to whether or not they fell below the third percentile of weight for age yielded no significant difference between cases and controls.

The last recorded weight and height for each child was examined to determine if the percentile of height for age, weight for age, or weight for height fell below 25. No significant differences were noted between cases and controls.

For those children with more than one nutritional monitoring, the weight data was examined to determine if there had been weight loss between the next to last weighing and the last one. There were only six deaths and 10 controls with more than one weighing. However, between these deaths and controls there was a notable difference. Two-thirds of the cases (4/6) compared with none of the controls demonstrated weight loss (see Table 3).

Table 3
Numbers of Case and Control Children in Carabuco
Who Lost Weight Between the Next to the Last and the
Last Recorded Weighing

	lost weight		
	yes	no	total
cases	4	2	6
controls	0	10	10
total	4	12	16

uncorrected Chi Square = 8.89
Fisher's exact 2-tailed P-value = 0.008

Vaccination Status

There were no significant differences between cases and controls with respect to immunization against BCG, DPT1, OPV1. Because of the young ages of the cases and controls, very few had received additional immunizations beyond these. When the total number of vaccinations received were calculated for each child, there was no significant difference between cases and controls.

Family Status

There was no significant difference between cases and controls in the average age of the mother at the time of birth of the child. After dividing mothers into two groups, those under 18 years of age and those 18 and older, a level of statistical significance of 0.054 was obtained. Twenty-four percent of the case children had mothers under 18 years of age compared to only 6% of the control children.

The birth interval between study children and their next oldest sibling was compared. There was no significant difference in the average birth interval between cases and controls. When these data were dichotomized into intervals of less than 24 months and 24 months or more, no significant differences were observed either.

The total number of siblings in the family in addition to the study child was compared. The case children had a mean of 2.5 siblings while the control children had an average of 3.8 siblings, a statistically significant difference (see Table 4).

Table 4
Mean Number of Siblings Among Case and Control Children in Carabuco

	mean number of siblings	standard deviation
case	2.48	1.85
control	3.80	2.23

df (1/73) t = 6.50 p = .012

At the time of a routine home visit, the marital status of each person of marriage age is noted. This information was abstracted from the family health folder. As shown in Table 5, one can readily see that 28% (7/25) of the deaths were among children with unmarried mothers while only 8% (4/50) of the controls had unmarried mothers.

Table 5
Marital Status of Mothers of Case and Control Children in Carabuco

	marital status of mother		
	unmarried	married	total
cases	7	18	25
controls	4	46	50
total	11	64	75

uncorrected Chi Square = 5.33
Fisher's exact two-tailed P-value = 0.035

Discussion

This analysis of infant deaths in Carabuco points to three dominant factors associated with greater risk of infant death. From the standpoint of statistical significance, the strongest risk factors are evidence of weight loss before death and having fewer siblings (see Table 6). The mother being unmarried is the third risk factor, with a level of statistical significance not quite as strong as the first two.

Table 6
Risk Factors for Infant Deaths in Carabuco
Listed by Level of Statistical Significance

factor	level of statistical significance
1. evidence of weight loss before death	.01
2. fewer siblings	.01
3. mother unmarried	.04

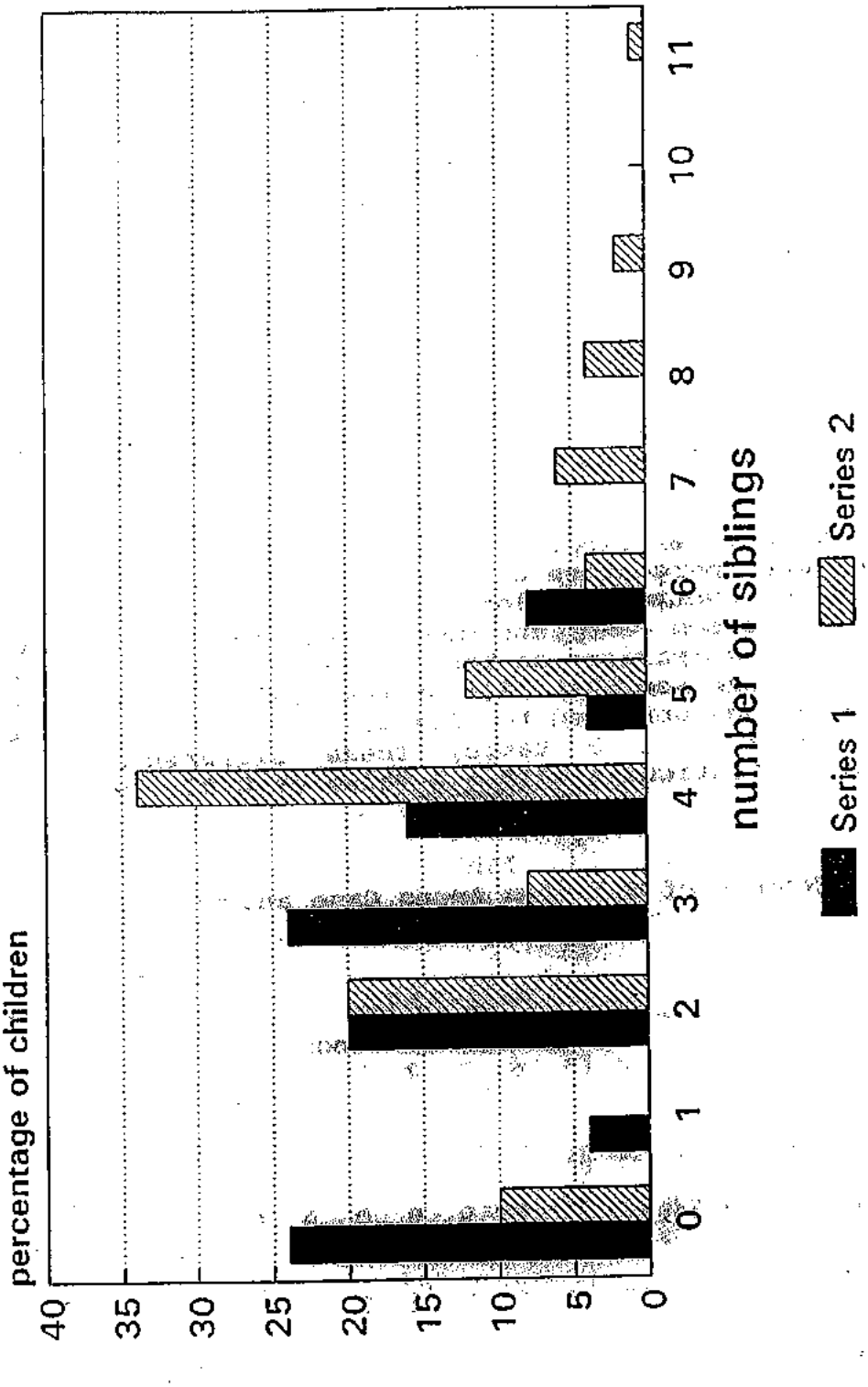
The rationale for weight loss as a risk factor is readily apparent. Either acute primary malnutrition or acute infection aggravating nutritional status is presumably the explanation for this finding.

Why having fewer siblings is a risk factor for death is less clear. A greater percentage of the case children had no siblings than did the control children (24% versus 10%), but the differences between case and control children extended beyond this particular comparison as Table 7 and Figure 1 indicate. For instance, one can see that 72% of the case children had fewer than four siblings compared to 38% of the control children. When displayed in a 2 x 2 table, these differences are highly significant statistically with a p value of 0.01 (see Table 8).

Table 7
Number of Siblings Among Case and Control Children in Carabuco

	number of siblings												
	0	1	2	3	4	5	6	7	8	9	10	11	total
cases	6	1	5	6	4	1	2	0	0	0	0	0	25
(percent)	24	4	20	24	16	4	8	0	0	0	0	0	100
controls	5	0	10	4	17	6	2	3	2	0	0	1	50
(percent)	10	0	20	8	34	12	4	6	4	0	0	2	100

Figure 1: Percentage of Children in Carabuco With Given Number of Siblings



series 1: case children
series 2: control children

Table 8
Comparison of Numbers of Case and Control Children in Carabuco by Family Size

	family size 0-3 siblings	4 + siblings	total
cases	18	7	25
controls	19	31	50
total	37	38	75

Yates corrected Chi Square = 6.41
P = 0.011

One might have anticipated a totally different result. One would think that perhaps diminished parental motivation or perhaps biological fatigue of the mother would lead to a higher risk of death for children with greater numbers of siblings, but we see no evidence to support such a hypothesis.

The above data support an alternative hypothesis: once there are four or more sibilings, there is sufficient additional help in the family for chores and child caring activities that a survival advantage is provided to newborns. This could be due to the siblings caring for the child or to possibly the mother having more time and energy to devote to the wellbeing of her newborn.

The significance of not being married as a risk factor for infant death is understandable, although the strength of this relationship is surprisingly strong. When one compares only those infants with no siblings, marital status becomes an even stronger risk factor for infant death. In Table 9 we see that all six of the case children without other siblings had an unmarried mother. In contrast, only 17% (1/6) of the control children with no siblings had an unmarried mother.

Children born to unmarried mothers may not be "wanted" to the same degree as those born to married mothers. Furthermore, the social and financial support available to the mother may be far more limited when the mother is unmarried.

Table 9
Marital Status of Mothers of Case and Control Children in Carabuco Without Other Siblings

	marital status of mother		
	unmarried	married	total
cases	6	0	6
controls	1	4	4
total	7	4	10

uncorrected Chi-Square = 7.54
Fisher's exact 2-tailed P-value = 0.015

STUDY QUESTIONNAIRE USED FOR CARABUCO
CASE-CONTROL STUDY

número de identificación __

CASO __
CONTROL __

nombre del caso que murio para comparar
_____

edad al morir el caso
_____

Formulario Para Estudio de Muertes con Controles
en Carabuco

Mayo, 1993

1. nombre del niño: _____
2. communidad: _____
3. fecha de nacimiento: _____
4. fecha de muerte: _____
5. edad al morir: _____
6. causa de muerte: _____
7. sexo: _____
8. tenía carnet de salud infantil? ____
9. datos nutricionales

a. fecha1 _____	peso1_____	talla1_____
b. fecha2 _____	peso2_____	talla2_____
c. fecha3 _____	peso3_____	talla3_____
d. fecha4 _____	peso4_____	talla4_____
e. fecha5 _____	peso5_____	talla5_____
f. fecha6 _____	peso6_____	talla6_____
g. fecha7 _____	peso7_____	talla7_____
h. fecha8 _____	peso8_____	talla8_____

10. datos de inmunizaciones

BCG _____
OPVi _____
OPV1 _____
OPV2 _____
OPV3 _____
DPT1 _____
DPT2 _____
DPT3 _____
sarampion _____

11. episodios de enfemedades:_____

_____

12. edad de la madre en la fecha de muerte del niño (caso o control) _____

13. hijos vivos en y su edad en la fecha del nacimiento del niño (caso o control)

hermano 1 _____ meses (el menor)
hermano 2 _____ meses
hermano 3 _____ meses
hermano 4 _____ meses
hermano 5 _____ meses
hermano 6 _____ meses
hermano 7 _____ meses
hermano 8 _____ meses
hermano 9 _____ meses
hermano 10 _____ meses
hermano 11 _____ meses
hermano 12 _____ meses

14. estado civil:_____.

15. grado de instrucción de la madre:_____

16. ocupación del padre:_____

17. anotaciones:_____
_____

CASE-CONTROL STUDY OF INFANT AND CHILDHOOD DEATHS IN MALLCO RANCHO, BOLIVIA

In May, 1993, family health folders were reviewed for those infants and children under five years of age who died in 1991 and 1992 in Mallco Rancho and whose deaths were registered in the health information system. Thirty-one children and 62 controls were included in this study, and their ages at death ranged from one hour of life to 36 months of age.

For each death identified, two controls were selected. A child qualified as a control if he or she lived in a nearby house and was born within six months (either before or after) of the child who died. The family folder for the house closest to the house of the child who died was first examined until a suitable control was found. Two control children were selected for each death. For the control children, information was abstracted relevant for that child up until the age at which the comparison child had died.

Information was abstracted for the family health folder for each child who died and for each of the two control children. The attached questionnaire was used for this purpose. This information was then computerized using EPI INFO software.

RESULTS

There were 31 infant and child deaths and 62 controls in this study. There was no significant difference between the two groups in terms of sex distribution. The causes of death for the 31 cases are shown in Table 1. Approximately one-third of the deaths were caused by diarrhea. A variety of other diagnoses were encountered with malnutrition and pneumonia being the most common. Two children drowned and a third died from head trauma. Meningitis was diagnosed in the two children who died from tuberculosis.

Table 1
Causes of Death Among Infants and Children in Mallco Rancho
Included in the Case-Control Study

cause of death	number	percent
diarrhea	9	29%
malnutrition	4	13%
pneumonia	3	10%
tuberculosis	2	7%
fever (unspecified)	2	7%
drowning	2	6%
asphyxia	2	6%
trauma	1	3%
prematurity	1	3%
unknown or traditional cause given*	5	16%
TOTAL	31	100%

* arrebato (soul loss) in three cases, agitation in one case, and unkown in one case.

Table 2 shows the ages at death for the 31 case children included in the study. The most frequent age category shown is from 12-23 months when one-third of the deaths occurred. Only 13% of the deaths occurred during the first month of life.

Table 2
Ages at Death for the 31 Cases Included in the Mallco Rancho Case Control Study

Age	Number of Children	Percentage
less than 1 week	3	10%
1-4 weeks	1	3%
1-2 months	3	10%
3-5 months	5	16%
6-11 months	6	19%
12-23 months	10	32%
24-36 months	3	10%
TOTAL	31	100%

Nutrition

The presence of a growth chart was distinctly different between cases and controls. Thirty percent (9/30) of the cases did not have a growth chart compared to only 7% (4/61) of the controls (see Table 3). Not surprisingly, there is also a significant difference in the mean number of nutritional monitorings between cases and controls as shown in Table 4.

Table 3
Presence of Growth Chart Among Case and Control Children in Mallco Rancho

	presence of growth chart		
	yes	no	total
cases	21	9	30
controls	57	4	61
total	78	13	91

uncorrected Chi-Square = 9.03
Fisher's exact 2-tailed p value = 0.008

Table 4
Comparison of the Mean Number of Nutritional Monitorings for Case and Control Children in Mallco Rancho

	mean number of nutritional monitorings		
cases	2.7		
controls	4.0		
		df	
SS between	35.3	1	t = 4.28
within	749.8	91	p = 0.039

Birthweights obtained on the day of birth were recorded in the growth charts for 13% of the children (12/91). Three of these birthweights were 2.5 kilograms or less. Only one of these three children died. Low birthweight children were defined as those weighing less than 3.0 kilograms during the first month of life. Fourteen children had been weighed before completing the first month of life. There was no significant difference between cases and controls in the incidence of low birthweight as has been defined above.

For each height and weight obtained at a growth monitoring session, the National Center for Health Statistics percentile for height for age (HAP), weight for age (WAP), and weight for height (WHP) were determined using the date of the monitoring and the birthdate to determine the age of the child. EPI INFO nutritional software was used for this analysis. The mean percentiles were calculated for case and control children for the first weighing and compared. This was also done for each successive monitoring.

No significant differences were noted for any of the comparisons between the case and control children up through the seventh nutritional monitoring. Beyond this, there were fewer than three children in the case group who had had more than seven nutritional monitorings, so the analysis was discontinued at that point. The only notable finding from this analysis was that for the WAPs, the differences between the case and control children gradually increased with successive weighings. None of the specific comparisons were statistically significant, however. These findings are shown in Table 5. The mean WAP for the control children gradually falls from 40.6 at the initial weighing to 17.1 at the time of the seventh weighing while the control children maintained their WAP mostly in the 30 - 35 % range. Thus, the percentage difference in the mean WAP percentiles

between the two groups gradually changed from + 4.8% at the time of the initial weighing to -15.1% at the time of the seventh weighing.

Table 5
Comparison of Mean Weight for Age Percentiles (WAP) of Case and Control Children in Mallco Rancho by Monitoring Number

weighing number	mean WAP* cases	controls	percentage difference
1	40.6 (21)	35.8 (52)	4.8
2	38.2 (18)	37.3 (46)	0.9
3	33.0 (14)	38.8 (37)	-5.8
4	25.3 (10)	33.5 (30)	-8.2
5	17.8 (7)	32.8 (25)	-15.0
6	18.5 (7)	28.8 (24)	-10.3
7	17.1 (3)	32.2 (19)	-15.1

* The number of children on which the means are based are shown in parentheses.

Children were classified as to whether or not they fell below the third percentile of weight for age at each of the specific nutritional monitoring sessions. There were no significant differences between case and control children in the numbers of children falling below the third percentile for any given weighing through the seventh one.

Children were also classified as to whether or not they were below the 25th percentile of height for age, weight for age, or weight for height at the time of the last recorded nutritional monitoring. Again, there were no statistically significant differences when case and control children were compared. Finally, each child was classified as to whether or not there was a loss of weight from the next to the last weighing until the final recorded weighing. Again, there was no significant difference between cases and controls.

Vaccination Status

There was a highly significant difference between cases and controls in the percentage of children who had received BCG vaccination as shown in Table 5. Forty-five percent (14/31) of the cases compared to 84% of the controls had received the BCG vaccination.

Table 5
Comparison of Numbers of Case and Control Children in Mallco Rancho Receiving BCG Vaccination

	BCG vaccination		
	yes	no	total
cases	14	17	31
controls	52	10	62
total	66	27	93

Yates corrected Chi-Square = 13.21
p = 0.0003

There was also a highly significant difference between the case and control children regarding DPT vaccinations. As Table 6 demonstrates, 42% (13/31) of the cases compared to 76% (47/62) of the controls had received the DPT1 vaccination. There was also a highly significant statistical difference for DPT2 as well. Thirty-two percent (10/31) of the cases compared to 65% of the controls had received DPT2 vaccination. There was no significant difference between case and control children regarding DPT3 vaccinations.

Table 6
Comparison of Numbers of Case and Control Children in Mallco Rancho Receiving DPT1 Vaccination

	DPT1 vaccination		
	yes	no	total
cases	13	18	31
controls	47	15	62
total	60	33	93

Yates corrected Chi-Square = 8.93
p = 0.003

Table 7
Comparison of Numbers of Case and Control Children in Mallco Rancho Receiving DPT2 Vaccination

	DPT2 vaccination		
	yes	no	total
cases	10	21	31
controls	40	22	62
total	50	43	93

Yates corrected Chi-Square = 7.40
p = 0.007

Similar differences were noted for the OPV vaccinations as shown in Tables 8-10. Forty-five percent (14/31) of the case children compared to 81% (50/62) of the control children had received OPV1, and 32% (10/31) of case children compared to 68% (42/52) of control children had received OPV2. There was also a significant difference with respect to OPV3 vaccinations. Twenty-six percent (8/31) of the case children compared to 52% of the control children had received OPV3.

Table 8
Comparison of Numbers of Case and Control Children in Mallco Rancho Receiving OPV1 Vaccination

	OPV1 vaccination		
	yes	no	total
cases	14	17	31
controls	50	12	62
total	64	29	93

Yates corrected Chi-Square = 10.53
p = 0.001

Table 9
Comparison of Numbers of Case and Control Children in Mallco Rancho Receiving OPV2 Vaccination

	OPV2 vaccination		
	yes	no	total
cases	10	21	31
controls	42	20	62
total	52	41	93

Yates corrected Chi-Square = 9.17
p = 0.002

Table 10
Comparison of Numbers of Case and Control Children in Mallco Rancho Receiving OPV3 Vaccination

	OPV3 vaccination		
	yes	no	total
cases	8	23	31
controls	32	30	62
total	40	53	93

Yates corrected Chi-Square = 4.61
p = 0.032

There was no significant difference in measles vaccination status between the two groups. Twenty-three percent (7/31) of the case children had received measles vaccination prior to death compared to 39% of the control children.

On the basis of the above findings, it is not surprising to observe that the total number of vaccinations received for case children was significantly less than for control children, (see Table 11). Control children had received almost twice as many vaccinations as had case children.

Table 11
Comparison Between Case and Control Children in Mallco Rancho in the Mean Number of Vaccinations Given

	mean number of vaccinations given		
cases	2.7		
controls	5.1		
		df	
SS between	116.2	1	t = 12.03
within	875.0	91	p = 0.001

Family Status

There was no significant difference between cases and controls in the mean age of the mother at the time of birth of the child. When mothers were classified as to whether or not they were under the age of 18 at the time of death of the child (or at the time of completion of the control child's review), no significant differences were observed.

The birth interval between study children and their next oldest sibling was compared. The mean birth interval did not differ for the two groups. When birth intervals were classified into less than 24 months and 24 or more months, no significant differences were observed either.

Mothers were classified as to marital status, and no significant differences were observed.

DISCUSSION

The highly significant differences observed in the vaccination status of case compared to control children together with the notable differences between them in enrollment in growth monitoring provides strong evidence that the children in Mallco Rancho who were dying in 1991 and 1992 were much less likely to have been incorporated into the child survival program. Whether the child survival interventions themselves are the reason for the differences in survival between case and control children or some other characteristic associated with the administration of the child survival interventions cannot be determined at this time.

One wonders if perhaps the deaths are not concentrated among those children whose mothers were not bringing them to the health center in Mallco Rancho for growth monitoring and vaccination services to the same degree as were the mothers of control children. In theory, the home visitation program should be identifying those not receiving the appropriate child survival interventions. It does not appear from these data that the home visitation program in Mallco Rancho was sufficiently well-developed during 1991 and 1992 to capture those children not receiving basic services or that perhaps the mothers of these children were particularly resistant to efforts of program staff to provide the basic child survival services.

The lack of any association between malnutrition measures and childhood death makes it tempting to speculate again that perhaps many of those children who died who did not receive nutritional monitoring were actually malnourished. Thus, if they had received growth monitoring, differences in nutritional status between case and control children would have been observed.

STUDY QUESTIONNAIRE USED
Mallco Rancho Case-Control Study

número de identificación __

CASO ___
CONTROL ___

nombre del caso que murio para comparar
_____

edad al morir el caso
_____

Formulario Para Estudio de Muertes con Controles
en Mallco Rancho

Mayo, 1993

1. nombre del niño:_____
2. communidad: _____
3. fecha de nacimiento:_____
4. fecha de muerte:_____
5. edad al morir:_____
6. causa de muerte:_____
7. sexo:_____
8. tenía carnet de salud infantil? ____
9. datos nutricionales

a. fecha1 _____	peso1 _____	talla1 _____
b. fecha2 _____	peso2 _____	talla2 _____
c. fecha3 _____	peso3 _____	talla3 _____
d. fecha4 _____	peso4 _____	talla4 _____
e. fecha5 _____	peso5 _____	talla5 _____
f. fecha6 _____	peso6 _____	talla6 _____
g. fecha7 _____	peso7 _____	talla7 _____
h. fecha8 _____	peso8 _____	talla8 _____
i. fecha9 _____	peso9 _____	talla9 _____
j. fecha10 _____	peso10_____	talla10_____
k. fecha11 _____	peso11_____	talla11_____
l. fecha12 _____	peso12_____	talla12_____

10. datos de inmunizaciones

BCG _____
OPVi _____
OPV1 _____
OPV2 _____
OPV3 _____
DPT1 _____
DPT2 _____
DPT3 _____
sarampion _____

11. episodios de enfemedades:_____

_____

12. edad de la madre en la fecha de muerte del niño (caso o control) _____

13. hijos vivos en y su edad en la fecha del nacimiento del niño (caso o control)

hermano 1 _____ meses (el menor)
hermano 2 _____ meses
hermano 3 _____ meses
hermano 4 _____ meses
hermano 5 _____ meses
hermano 6 _____ meses
hermano 7 _____ meses
hermano 8 _____ meses
hermano 9 _____ meses
hermano 10 _____ meses
hermano 11 _____ meses
hermano 12 _____ meses

14. estado civil:_____

15. grado de instrucción de la madre:_____

16. ocupación del padre:_____

17. anotaciones:_____
_____

CASE-CONTROL STUDY OF INFANT AND CHILDHOOD DEATHS IN VILLA COCHABAMBA/MONTERO, BOLIVIA

In May, 1993, family health folders were reviewed for those infants and children under five years of age who had died in 1992 and whose death had been registered in the Villa Cochabamba health information system. In contrast to the Carabuco case-control study, this study did include children older than one year of age since we knew that children in Montero beyond one year of age were also at significant risk of death. Twenty-five infants and children under five were included, and their ages at death ranged from three days to 32 months.

For each death identified, two controls were selected. A child qualified as a control if he or she lived in a nearby house and was born within six months (either before or after) of the child who died. The family folder for the house closest to the house of the child who died was first examined for the presence of a suitable control. If none was found, then the family folder for the next closest house was examined until a suitable control was found. Two control children were selected for each death. For the control children, information was abstracted relevant for that child up until the age at which the comparison child had died.

Information was abstracted from the family health folder for each child who died and for each of the two control children. The attached questionnaire was used for this purpose. This information was then computerized using EPI INFO software.

RESULTS

There were 25 infant and child deaths and 50 controls in this study. There was no significant difference between the two groups in terms of sex distribution. The causes of death for the 25 cases are shown in Table 1. Over half of the deaths were associated with diarrhea, and one-third of the deaths had malnutrition listed as one of the causes of death. Only 16% of the deaths were associated with respiratory causes. The two deaths due to prematurity were among twins, both of whom died at three days of age.

Table 1
Causes of Death Among Infants and Children in Montero Included in the Case-Control Study

cause of death	number	percent
diarrhea	7	28%
diarrhea and malnutrition	6	24%
malnutrition	3	12%
pneumonia	3	12%
fever (unspecified)	2	8%
prematurity	2	8%
diarrhea and pneumonia	1	4%
poisoning	1	4%
TOTAL	25	100%

Table 2 shows the ages at death for the 25 cases included in the study. The most frequent age category shown is from 12-23 months of age. Only 12 percent of the deaths occurred during the first month of life.

Table 2
Ages at Death of the 25 Cases Included in the Montero Case Control Study

Age	Number of Children	Percentage
less than 1 week	2	8 %
1-4 weeks	1	4 %
1-2 months	3	12 %
3-5 months	2	8 %
6-11 months	4	16 %
12-23 months	10	40 %
24-35 months	3	12 %
TOTAL	25	100 %

Nutrition

Sixty-four percent of the children who died compared to 86% of the control children had growth charts, but this difference did not quite reach statistical significance ($p = 0.058$). There was no significant difference in the number of nutritional monitorings (weight and height determinations) between the case and the control children.

In an attempt to assess the effect of birth weight on mortality, a child was classified as being of low birth weight if a weight recorded during the first month of life was below three kilograms. There was no significant difference between the case and control children in this respect. Information on weight on the actual date of birth was recorded for only two children.

The weight and height for each nutritional monitoring, along with the date of the monitoring and the date of birth, was used to calculate the percentile of height for age, weight for age, and weight for height using EPI INFO nutritional software. These percentiles are based on the National Center for Health Statistics norms. The mean percentile of height for age (HAP) for the child's first nutritional monitoring differed significantly between cases and controls. The mean HAP for cases was 32% while for controls it was 53% (see Table 3).

Table 3
Comparison of Height for Age Percentiles (HAP) at the Time of the Initial Growth Monitoring for Cases and Controls in Montero

	mean HAP percentile		
cases	32.0%		
controls	52.9%		
		df	
SS between	3290.2	1	$t = 4.41$
within	22382.7	30	$p = 0.042$

The initial weight for height percentile (WAP) also differed significantly between cases and controls (see Table 4). For cases, the mean WAP was 42% compared to 64% for controls.

Table 4
Comparison of Weight for Age Percentiles (WAP) at the Time of the Initial Growth Monitoring for Cases and Controls in Montero

	mean WAP percentile		
cases	42.2%		
controls	63.9%		
		df	
SS between	5068.2	1	t = 4.81
within	49488.0	47	p = 0.031

The weight for height percentile (WHP) at the initial weighing did not differ significantly between cases and controls.

There were no significant differences between case and control children at the second weighing in any of the nutritional percentiles. Comparing the third nutritional monitoring results, a significant difference appears in the weight for age percentile (WAP). For the cases, the mean WAP was only 11% while it was 45% for the controls (see Table 5). The difference in the means of the percentiles of height for weight at the third monitoring approached but did not quite reach statistical significance ($p = 0.057$). There were 26 children that had been weighed three times but only 13 who had had height determinations also at the time of the third weighing. Because of the small number of children who had additional growth monitorings, the differences in percentiles between case and control children at the fourth or later monitoring sessions were not statistically significant.