Risk selection and detection. A critical appraisal of the Dutch obstetric system
Bais, J.M.J.

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Chapter 3

Risk selection, the core of the Dutch obstetric system: an empirical analysis of the ZAVIS cohort

3.1. Introduction

3.1.1. General outline

The general outline of risk selection is discussed in Chapter 2. That chapter describes all consecutive stages of the obstetrical selection process in a quantitative fashion. This selection process is described as a unidirectional one: women can only 'upgrade' to a higher-risk class (parallel to referral from primary to secondary care), and will very seldom return to a lower-risk class. Both the obstetric registration system and the insurance system have no facilities for a 'degrading'.

The assignment of risk, being a critical part of the Dutch two-tier system, is part of professional training, supported by guidelines and embodied by insurance rules. In this chapter we study the indications (labels) for secondary care and the risk factors related to available guidelines. We also put the observed probabilities to become a 'high risk' into historical perspective.

Although all data analysis is essentially observational, we believe still some provisional conclusions can be made if we are prepared to assume that from a biological point of view the pregnancy process has not changed that much over the last 30 years, apart from the average age at reproduction.

This chapter consists of two parts. In the first part (Sections 3.2.1–3.2.5) we quantify this selection process using the entire observed cohort of ZAVIS women as starting point. This part provides numbers on the proportion of women selected out of the starting cohort for reasons of high risk ('transition probability'), at the subsequent stages of the pregnancy. Each subsection describes the selection process at a particular ramification: initial high risk versus initial low risk at onset (Section 3.2.1), high risk emerging during pregnancy (Section 3.2.2), during first or second stage of delivery (Section 3.2.3), during third stage or direct postpartum (Section 3.2.4) and during puerperium (Section 3.2.5). After the presentation of some key numbers each subsection provides a short description of key risk factors responsible for the risk to be upgraded.

In the second part of this chapter (Sections 3.3.1 and 3.3.2) we present a historical comparison of our quantitative risk selection data with available other Dutch data sources. First we compare the high-risk probabilities observed in ZAVIS with similar data from the Dutch National Perinatal Databases (LVR1 and LVR2) most relevant to this period. This comparison provides a rough estimate of the representativeness of
ZAVIS at the time of the cohort study. Next we compare more global figures of ZAVIS with a set of historical data to analyse observed trends.

To facilitate presentation we now first present the approach of analysis and the data used in Sections 3.2 and 3.3 in more detail.

3.1.2. Approach and data underlying the analysis of high-risk assignment in ZAVIS (Section 3.2)

High-risk tree

Risk upgrades take place all the time during pregnancy. Starting with a cohort, and taking a chronological perspective, the following risk branches of a 'high-risk tree' may be distinguished in order of occurrence:

- initially high risk;
- emerging high risk with subsequent referral during pregnancy;
- emerging high risk with subsequent referral during first and second stage of delivery;
- emerging high risk with subsequent referral during third stage of delivery or direct postpartum;
- emerging high risk with subsequent referral during puerperium.

What remains is the cohort of low-risk pregnant women, who were not referred during the complete child-bearing process. These women (and those referred at third stage or later) deliver their babies under responsibility of midwifery care.

Data are dichotomised according to parity. Age (indicator for both medical and non-medical factors) is systematically shown.

Fig. 3.1a shows an overview of the risk selection process as observed in ZAVIS. Fig. 3.1b and c show the risk selection process in younger and older women, defined as < 35 years and ≥35 years, respectively at expected date.

Initially high-risk pregnancies: comparison with guidelines

Three issues are elaborated here to provide background to the comparative analysis with guidelines:

(a) the source guideline document used,
(b) the data extraction process on risk assignment in ZAVIS,
(c) the comparison of observed risk factors assigned vs guidelines.

Ad a. Guidelines

The obstetric manual Werkgroep Bijstelling Kloosterman list [1] (a later edition is known as Verloskundige Indicatie Lijst (VIL)), the official guideline during the study period, is the context to judge risk factors. Risk assignment in this list is connected to the level of care deemed necessary. Risk factors are regarded low allowing for primary
Fig. 3.1. (a) The risk selection process: selection between initially low risk and initially high risk, and referral during pregnancy, delivery (first/second stage, third stage/direct postpartum) and puerperal period from low to high risk (% is derived from the complete cohort, N=3795). (b) The risk selection process in women up to 35 years. (c) The risk selection process in older women, ≥35 years.
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Nulliparous women
\(N=3617\)

Initially high risk
\(N=438\ (12.1\%)

Initially low risk
\(N=3179\)

Referral during pregnancy
\(N=898\ (24.7\%)

Low risk during pregnancy
\(N=2281\)

Referral 1st/2nd stage
\(N=895\ (24.8\%)

Referral during pregnancy
\(N=1286\)

Low-risk 1st/2nd stage
\(N=91\ (2.5\%)

Referral 3rd stage direct postpartum
\(N=75\ (2.1\%)

Referral puerperium
\(N=62\ (1.7\%)

Continued low risk
\(N=1220\ (33.7\%)

Multiparous women
\(N=3608\)

Initially high risk
\(N=929\ (25.8\%)

Initially low risk
\(N=2679\)

Referral during pregnancy
\(N=365\ (10.1\%)

Low risk during pregnancy
\(N=2314\)

Referral 1st/2nd stage
\(N=213\ (5.9\%)

Low-risk 1st/2nd stage
\(N=2101\)

Referral 3rd stage direct postpartum
\(N=57\ (1.6\%)

Low-risk 3rd stage direct postpartum
\(N=2044\)

Referral puerperium
\(N=62\ (1.7\%)

Continued low risk
\(N=1982\ (54.9\%)

(b)

Fig. 3.1. Continued.
Nulliparous women
\[ N=178 \]
- Initially high risk
  \[ N=77 (43.3\%) \]
- Initially low risk
  \[ N=101 \]
- Referral during pregnancy
  \[ N=38 (21.3\%) \]
- Referral 1st/2nd stage
  \[ N=32 (18.0\%) \]
- Low-risk 1st/2nd stage
  \[ N=31 \]
- Low-risk 3rd stage direct postpartum
  \[ N=3 (1.7\%) \]
- Referral puerperium
  \[ N=1 (0.6\%) \]
- Continued low risk
  \[ N=27 (15.0\%) \]

Multiparous women
\[ N=628 \]
- Initially high risk
  \[ N=257 (40.9\%) \]
- Initially low risk
  \[ N=371 \]
- Referral during pregnancy
  \[ N=55 (8.8\%) \]
- Referral 1st/2nd stage
  \[ N=44 (7.0\%) \]
- Low-risk 1st/2nd stage
  \[ N=272 \]
- Low-risk 3rd stage direct postpartum
  \[ N=6 (1.0\%) \]
- Referral puerperium
  \[ N=8 (1.3\%) \]
- Continued low risk
  \[ N=258 (41.1\%) \]

Fig. 3.1. Continued.
Chapter 3

care, high requiring secondary care, or intermediate requiring consultation between primary and secondary care. The recommendations in the obstetric manual are based on arguments on effectiveness and efficiency. The guidelines as they stand are the result of a consensus procedure in which all professional associations involved in obstetric care participated. As far as possible guidelines are based on scientific evidence, but substituted by expert opinion in many occasions.

The general rule of the obstetric manual (WBK list) is that low risk should be assumed, unless signs, symptoms, obstetrical or medical history point to increased risk. Secondary care should have an additional value in diagnostic and/or therapeutic possibilities.

In daily practice, however, the choice of caregiver can be influenced by a long-standing relationship between the obstetric professional (midwife, family doctor or obstetrician) and the pregnant woman rather than a rational choice based on risk assessment.

Ad b. Data extraction

The extraction of the risk factor from the ZAVIS database (Table 3.1) faced at least three difficulties:

(1) The classification of risk factors offered by LVR and ZAVIS is limited and incompatible with the WBK list. This represents a formidable barrier to use registry data like LVR and ZAVIS for direct analysis of risk selection according to the WBK list.
(2) The registration procedure with regard to risk factors is neither continuous nor cumulative. Obstetricians, midwives and general practitioners consider risk factor(s) at the booking visit or in case of suspected risk factor during referral. Once high-risk status has been assigned, emerging or uncovered risk factors will not easily be added. For example, suspected intrauterine growth retardation in third trimester in an initially high-risk pregnancy due to hypertension, which is a risk factor in the general medical history. Very likely hypertension will be recorded.
(3) No codification rules were available to guide the caregiver filling out the registry form with respect to risk factors, particularly in case of multiple, related or subsequent risk factors. As a consequence, codification of the medical indication, the most important risk factor, could either be the first or ‘the most important’, at the discretion of the obstetrician or resident who enters the data in the form (here computerised form) with considerable risk for heterogeneity.

Preformatted forms are limited and do not justice to the set of considerations leading to the assignment of the medical indication. For example the WBK list prescribes primary care in the case of first trimester blood loss. In the case of incidental blood loss with a viable fetus this is justified, but with recurrent blood loss or blood loss originating from the placenta the relative risk for preterm birth increases. In the latter case continued secondary care seems indicated. If blood loss during first half of pregnancy is selected as medical indication, this is not conform the obstetric manual.
Table 3.1
Initially high-risk pregnancies in nulliparous ($N=515$) and multiparous women ($N=1186$), by indication as percentage of initially high-risk pregnancies and between brackets percentage of the complete cohort (respectively $N=3795$ and $N=4240$)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Nulliparous</th>
<th></th>
<th>Multiparous</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N=515$</td>
<td>$N=1186$</td>
<td>$N=3795$</td>
<td>$N=4240$</td>
</tr>
<tr>
<td></td>
<td>$N$</td>
<td>$%$</td>
<td>$N$</td>
<td>$%$</td>
</tr>
<tr>
<td>Obstetrical history:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caesarean section</td>
<td>–</td>
<td>–</td>
<td>252</td>
<td>21</td>
</tr>
<tr>
<td>Severe neonatal morbidity</td>
<td>–</td>
<td>–</td>
<td>138</td>
<td>12</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>–</td>
<td>–</td>
<td>106</td>
<td>9</td>
</tr>
<tr>
<td>PPH* – retained placenta</td>
<td>–</td>
<td>–</td>
<td>69</td>
<td>6</td>
</tr>
<tr>
<td>Perinatal mortality</td>
<td>–</td>
<td>–</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>(Pre)eclampsia or abruptio</td>
<td>–</td>
<td>–</td>
<td>53</td>
<td>4</td>
</tr>
<tr>
<td>Other obstetric</td>
<td>–</td>
<td>–</td>
<td>57</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>745</td>
<td>63 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medical history:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gynaecologic problem</td>
<td>133</td>
<td>26</td>
<td>94</td>
<td>8</td>
</tr>
<tr>
<td>Infertility problem</td>
<td>101</td>
<td>20</td>
<td>32</td>
<td>3</td>
</tr>
<tr>
<td>Endocrinology problem</td>
<td>29</td>
<td>5</td>
<td>38</td>
<td>3</td>
</tr>
<tr>
<td>Chronic hypertension</td>
<td>25</td>
<td>5</td>
<td>37</td>
<td>3</td>
</tr>
<tr>
<td>Orthopaedic problem</td>
<td>22</td>
<td>4</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>Respiratory problem</td>
<td>19</td>
<td>4</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Neurological problem</td>
<td>10</td>
<td>2</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Cardiac problem</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Thrombo-embolism</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Anaemic related disease</td>
<td>7</td>
<td>1</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>3535</td>
<td>77 (11)</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>397</td>
<td>77 (11)</td>
<td>310</td>
<td>26 (7)</td>
</tr>
<tr>
<td>Pregnancy related:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>38</td>
<td>8</td>
<td>64</td>
<td>6</td>
</tr>
<tr>
<td>Age</td>
<td>38</td>
<td>7</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>42</td>
<td>8</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>118</td>
<td>23 (3)</td>
<td>131</td>
<td>11 (3)</td>
</tr>
</tbody>
</table>

*PPH, postpartum haemorrhage.

Although in the presence of additional information the viability of such an indication is questionable.

For our study purposes we decided to reclassify risk factors of each initially high-risk pregnant woman into the risk classes available from the WBK guidelines (see below). Reclassification was performed manually, and took all information into account.

Ad c. Comparison of risk information with the WBK list [1]

To evaluate if obstetricians follow recommendations of the guidelines in initially high-risk pregnancies we used the following schedule:
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- 'Conform': If the obstetric manual recommended exclusively secondary care or a risk factor which is deliberative, we indicated these indications as 'conform' (Table 3.2a).
- 'Not conform': If the manual recommended primary care (Table 3.2b).

Table 3.2a
Comparison of risk information with 'WBK' guidelines: initially high risk as recommended; high risk 'conform' guidelines

<table>
<thead>
<tr>
<th>Indication</th>
<th>Nulliparous N=515</th>
<th>Nulliparous N (%)</th>
<th>Multiparous N=1186</th>
<th>Multiparous N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetric history:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caesarean section</td>
<td>na</td>
<td>252</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preterm birth</td>
<td>na</td>
<td>106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perinatal mortality</td>
<td>na</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SGA (p≤2.3)</td>
<td>na</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asphyxia</td>
<td>na</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abruptio placenta</td>
<td>na</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pelvic floor reconstruction</td>
<td>na</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active blood group antagonism</td>
<td>na</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>486</td>
<td></td>
</tr>
<tr>
<td>General medical history:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervical amputation, cold knife conus</td>
<td>18</td>
<td></td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Insulin-dependent diabetes</td>
<td>5</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>4</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>10</td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Epilepsy with medication</td>
<td>4</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Bronchial asthma with medication</td>
<td>5</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Chronic hypertension</td>
<td>25</td>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Thrombo-embolism</td>
<td>5</td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Diseases related to anaemia</td>
<td>8</td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Ulcerative colitis, Crohn disease</td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Systemic disease</td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Psychiatric disease</td>
<td>6</td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>96</td>
<td></td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>Pregnancy related:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple</td>
<td>38</td>
<td></td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Preterm birth (16&lt; GA&lt; 20 weeks)</td>
<td>5</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Fetal death (16&lt; GA&lt; 20 weeks)</td>
<td>2</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Syphilis not treated</td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Drugs</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No prenatal care</td>
<td>4</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Congenital anomaly/unwanted</td>
<td>4</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>56</td>
<td></td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>152 (30%)</td>
<td></td>
<td>705 (59%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2b
Comparison of risk information with ‘WBK’ guidelines: initially high risk as not recommended; high risk ‘not conform’ guidelines

<table>
<thead>
<tr>
<th>Indication</th>
<th>Nulliparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=515</td>
<td>N=1186</td>
</tr>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
</tbody>
</table>

Obstetrical history:
- PPH with transfusion: na, 43
- Manual removal placenta +/- PPH: na, 18
- PPH without transfusion: na, 8
- SGA (2.3 < p ≤ 10): na, 26
- Preeclampsia with admission without IUGR: na, 29
- Severe preeclampsia*: na, 11
- Preeclampsia without admission without IUGR: na, 7
- Assisted vaginal delivery: na, 30
- Assisted vaginal delivery with shoulder dystocia: na, 4
- Complete tear: na, 7
- Symphysiolysis: na, 1
- Subtotal: 184

General medical history:
- Pregnancy after infertility: 102, 32
- Abnormal PAP smear: 30, 15
- Repeated miscarriage (< 16 weeks GA): 12, 11
- Intrauterine exposition to DES: 14, 6
- Bronchial asthma without medication: 13, 7
- Epilepsy without medication: 6, 2
- Previous ectopic pregnancy: 2, 2
- Subtotal: 186, 75

Pregnancy related:
- Age (expected date) < 36 years nulliparous: 1, na
- Age (expected date) ≥ 36 years nulliparous: 32, na
- Age (expected date) 36–40 years multiparous: na, 5
- Age (expected date) ≥ 40 years: 5, 12
- Grande multiparous: na, 7
- Psycho-social indication: 6, 12
- Late start of prenatal care: 3, 7
- Hyperemesis: 6, 3
- Hepatitis B-positive serology: –, 1
- Pregnancy with IUD, removed: 1, 1
- Pregnancy with IUD, not removed: –, 1
- Pregnancy during OAC: –, 1
- Subtotal: 54, 50

Total: 240 (47%), 309 (26%)%

*Severe preeclampsia is defined as (pre)eclampsia with admission in term birth and/or SGA (2.3 < p ≤ 10).
Table 3.2c

Comparison of risk information with 'WBK' guidelines: initially high risk assigned as 'indeterminate'; of these risk factors either complete information was not available\(^1\) or the specified risk factor was not mentioned at all\(^2\).

<table>
<thead>
<tr>
<th>Indication</th>
<th>Nulliparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N=515)</td>
<td>(N=1186)</td>
</tr>
<tr>
<td></td>
<td>(N(%))</td>
<td>(N(%))</td>
</tr>
<tr>
<td>Obstetrical history:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe congenital hereditary disease (^1)</td>
<td>4</td>
<td>53</td>
</tr>
<tr>
<td>Gestational diabetes (^2)</td>
<td>na</td>
<td>10</td>
</tr>
<tr>
<td>Macrosomia (^2)</td>
<td>na</td>
<td>3</td>
</tr>
<tr>
<td>Shoulder dystocia (^2)</td>
<td>na</td>
<td>2</td>
</tr>
<tr>
<td>Other complication in obstetric history (^1)</td>
<td>na</td>
<td>17</td>
</tr>
<tr>
<td>Subtotal</td>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>General medical history:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterus myomatosis (^1)</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Congenital anomaly of uterus (^2)</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Severe hereditary anomaly (^1)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Mole (^2)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Hyperprolactinemia (^2)</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Small stature (^2)</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Cor vitium (^1)</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Miscellaneous (^1)</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Subtotal</td>
<td>94</td>
<td>69</td>
</tr>
<tr>
<td>Pregnancy related:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood loss before 20 weeks of gestation (^1)</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Laparotomy during pregnancy (^1)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Ovarian tumour (^2)</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Subtotal</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>123 (23%)</td>
<td>172 (15%)</td>
</tr>
</tbody>
</table>

- If no decision could be made either due to lack of information (expressed by \(^1\) in Table 3.2c) or the indication was not discussed in the manual (expressed by \(^2\) in Table 3.2c), we indicated these indications as 'indeterminate'.

3.1.3. Approach and data underlying the comparisons of ZAVIS with contemporary and historic data (Section 3.3)

Contemporary comparison with LVR1 and LVR2

The Dutch national LVR data are subdivided in LVR1 and LVR2. The midwives provide the LVR1 data on primary care, the obstetricians the LVR2 data on secondary
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care. Although, LVR data are incomplete as 88% of midwives and 87% of obstetricians participate in the LVR (1993). Nine percent of the children are born under the responsibility of a general practitioner, only a few are represented in the LVR.

If primary care relates only to a part of the pregnancy, delivery or puerperium the woman is recorded not only in the LVR1, but also in the LVR2 by the obstetrician. Linking is essential to avoid double counting, but is as yet not easily possible due to privacy legislation. (Actually in 2004 the first successful attempt appeared using data of 2001.)

Both registries are hitherto uncombined and refer to different populations as denominator. Nevertheless we present some best guesses on absolute numbers and transition probabilities derived from LVR1 and LVR2 of the year 1993, being aware that such comparison is inevitably not perfect.

Historical comparison with other studies

We will compare the results of our cohort with other national data.

(a) Smits (SM) described the results of the risk selection process in a regional cohort of women who gave birth in 1974 in Enschede [2]. This cohort contained the results of 2005 pregnancies. The cohort was subdivided in three groups: (A) initially high risk, (B) initially low risk and referral to secondary care during pregnancy or delivery, and (C) continued low risk.

(b) The ‘Wormerveer study’ [3,4] (WV study). A long-term prospective follow-up study published in 1989. This study is a complete follow-up of all 7980 pregnancies in initially low-risk women in that region during the period 1969–1983. (Our ZA-VIS cohort also contained the ‘Wormerveer’ region.) This study focussed on the effectiveness of primary care, including selection performed by midwives in this region and the subsequent secondary care if necessary. The risk selection process was evaluated, as perinatal morbidity and mortality and perinatal audit [5] in the different groups.

(c) LVR data compiled by the SIG in 1996 (SIG-LVR) [6]. SIG Health Care Information published information from the Dutch National Perinatal Databases (LVR, Landelijke Verloskunde Registratie) in ‘Obstetrics in the Netherlands, Trends 1989–1993’, published in 1996. As all the women of the Zaanstreek study were also registered in the LVR, there is a partial overlap. The impact of ZAVIS on SIG-LVR will be minimal as it represents less than 1% of the LVR data, hence we regard ZAVIS and SIG-LVR for our purposes as two different data sets.


The OBINT study was based on the records of all 92491 women, receiving perinatal care by LVR1-associated midwives, whose delivery or referral data fell in the period from January up to December 1990.
3.2. An empirical description of risk selection in ZAVIS

3.2.1. Initially high-risk pregnancies

Epidemiology

Our cohort, defined to start at 16 weeks gestation, started with 3795 nulliparous and 4236 multiparous women. At the gestational age of 20 weeks the first risk selection process is concluded, and the distinction between initially high risk and remaining low risk is made.

Altogether 515 nulliparous women (14% from the original nulliparous cohort) and 1186 multiparous women (28% from the original multiparous cohort) were assigned ‘initially high risk’ (Fig. 3.1a).

Median age in nulliparous women was 27.6 years (standard deviation (SD) 4.5), in multiparous women 30.6 (SD 4.3).

Of all 178 (4.7%) older nulliparous women, defined as ≥35 years, 43.3% were initially high risk and underwent exclusively secondary care, compared to 12.1% in younger nulliparous women (Fig. 3.1b, c). Similar results are observed in 628 (14.8%) older multiparous versus younger multiparous women, respectively 40.9 and 25.8%.

The group of initially high risk comprises of:

(a) Women of whom first booking visit was – rightly – at the obstetrician. Due to risk factor(s) in the general medical, gynaecological, or obstetrical history the obstetrician identifies high risk and performs further prenatal care.

(b) Women of whom first booking visit was – erroneously – at the midwife. Taking the history, risk factor(s) become apparent and the woman is referred to the obstetrician. The obstetrician performs prenatal care.

(c) Women of whom first booking visit was – rightly – at the midwife. Risk factors in pregnancy (multiple pregnancy) or early pregnancy complications before 20 weeks of gestation (blood loss or congenital anomaly) become apparent at the first booking or at ultrasound. The woman is referred after the first booking visit or ultrasound, and the obstetrician performs prenatal care.

(d) Women with none, or only one prenatal visit after 20 weeks of gestation. This occurred in 116 women in our cohort.

Distribution of observed risk factors/medical indications

Table 3.1 describes the observed indications for initial (permanent) high risk in nulliparous and multiparous women. At this stage risk factors were grouped into (a) general medical history, (b) obstetrical history (multiparous only), and (c) pregnancy-related indications.

Of all indications for initially high risk 77% (397/515) were related to the general medical history. In 23% the indication was related to ‘pregnancy-related problems’, mostly multiple pregnancies, but also older women (age). As high age is not a disease or causative risk in itself, but only an indicator, we grouped these women into the ca-
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tegory ‘pregnancy-related problems’. In 35 of 397 women (8.8%) who were initially high risk related to the general medical history, a pregnancy-related problem coexisted (e.g. blood loss before 20 weeks of gestation).

The median age of nulliparous women whose indication was related to the general medical history was 29.0 years, that of pregnancy-related problems was 31.1 years, that of nulliparous women remaining low risk at this stage was 27.4 years.

In multiparous women the majority, 63% of indications (747/1186), were related to a previous pregnancy (obstetrical history), in 26% the indication for exclusively secondary care was related to the general medical history (Table 3.1). In about one third of those with a previous obstetric problem (209/747) a general medical history problem was also present. In only 11% the indication to select women as initially high risk was pregnancy related.

The median age of multiparous women with a general medical history risk was 32.5 years, of women with risk based on obstetrical reasons 30.6 years, of women with pregnancy-related problems 32.6 years, while the median age of women of remaining low risk was 30.3 years.

Prior considerations on classification of risk factors/indications for initially high risk

Four major initial high-risk groups deserve special attention for reasons of classification and conformity assignment: previous preterm birth, previous perinatal mortality, previous (pre) eclampsia and advanced age.

- In case of previous preterm birth the obstetric manual (WBK) advises consultation of the obstetrician if the last pregnancy ended before 34 weeks of gestation, but if the last pregnancy ended between 34 and 37 weeks primary care is advised. In case of two recurrent preterm births consultation is advised. In our database only ‘previous preterm birth’ was available, but not the specific gestational age of this preterm birth. Since we assumed that the obstetricians followed this guideline in this respect we accepted all records which stated ‘previous preterm birth’ as risk factor as ‘conform’ (see Section 3.1.2).

- In case of fetal death due to umbilical cord complications or infectious disease the manual advises primary care. In all other known causes, unknown causes and neonatal mortality consultation is advised. Because mortality due to umbilical cord complications and congenital infections is rare, we accepted the risk factor ‘perinatal mortality’ as referring to the latter common condition requiring consultation, hence as ‘conform’.

- In case of previous (pre) eclampsia the manual advises primary care; if we observed initial high-risk assignment without further notice, complete prenatal care performed by the obstetrician for this indication was regarded ‘not conform’. Severe preeclampsia combined with induced preterm birth and/or severe SGA (defined as $p \geq 2.3$) were selected as conform because preterm birth and severe SGA are indications for which the obstetric manual advises secondary care.

- In nulliparous women over 36 years and multiparous women above 40 years (at ex-
expected date of delivery) the guideline recommends initially low risk, and delivery in hospital under responsibility of midwife or general practitioner. An increased risk of complications during pregnancy and labour is recognised, but will become apparent during prenatal care, like a higher risk of hypertensive disorder and gestational diabetes. Due to a higher risk of failure to progress as a result of insufficient contractility of the uterus, caesarean section and assisted vaginal delivery, low Apgar score and admission on the neonatal ward, hospital delivery is advised.

\textit{Results}

In \textit{nulliparous} women (Fig. 3.2a) 30\% (N=152) of the observed risk factors could be retrieved in the obstetric manual (Table 3.2a), whereas 47\% (N=240) of the high-risk cases were not conform (Table 3.2b). In 23\% (N=123) of the cases conformity could not be established (Table 3.2c) and so were indeterminate.

In \textit{multiparous} women (Fig. 3.2b) 59\% (N=707) of the initially high-risk cases were
conform (Table 3.2a), 26% (N=310) were not conform (Table 3.2b) and in 15% (N=173) the indications were indeterminate (Table 3.2c).

**Previous preterm birth**

The obstetric manual recommends secondary care if preterm birth occurs before 34 weeks of gestation. The ZAVIS database did not record the gestational age at the previous preterm delivery. Therefore we do not know if assigned indications for exclusively secondary care were justified. 262 women had a previous preterm birth, 194 were assigned initially high risk and 68 as initially low risk. Of the 194 initially high-risk women in 69 cases (35.6%) previous preterm birth was indicated as medical indication.

**Age**

The criteria for advanced age were
- age ≥ 36 years for nulliparous women,
- age ≥ 40 years for multiparous women.

189 women in our cohort (107 and 82, respectively) met these criteria. Of those 61 and 46 underwent exclusively secondary care, and only in 37 (34.6%) and 12 (14.6%), respectively, age was the only risk factor and therefore the medical indication.

**PPH**

If previous birth was complicated by postpartum haemorrhage (blood loss ≥1000
ml) and/or retained placenta, the manual advised primary care and hospital delivery to prevent delay in time in cases of recurrence. In 199 multiparous women previous birth(s) were complicated by one of or both these risk factors. Most women (N=117) were selected as initially high risk (59%) and in 105 cases (90.0%) this was the most important risk factor and indicated as medical indication.

SGA

The obstetric manual advised exclusively secondary care in severe small for gestational age children (SGA $p \leq 2.3$) and primary care in moderate SGA ($2.3 < p < 10$). In the complete cohort of multiparous women these risk factors were recorded in 151 cases, 66 cases of severe SGA and 85 of moderate SGA. In 53 cases SGA was indicated as most important risk factor and the indication for exclusively secondary care. In 51% this was conform the obstetric manual, and therefore in 49% not conform, when it comes to moderate SGA.

Of the 66 cases in which the obstetrical history was complicated by severe SGA, 14 received no exclusively secondary care. Six of these cases were para 1 and exclusively secondary care seems to have been indicated.

Indeterminate

In 123 cases of nulliparous and in 173 cases of multiparous women high risk was 'indeterminate' either due to incomplete information or the risk factor was not mentioned in the obstetric guideline (Table 3.2c). Some risk factors in obstetrical history are interrelated, like assisted vaginal delivery, macrosomia, gestational diabetes and shoulder dystocia and can have different clinical impact and different prospects. If the assisted vaginal delivery is an easy extraction from the pelvic floor even in a child with a high birth weight, prospects for a forthcoming prosperous delivery are excellent and primary care is fully justified. However, if the assisted vaginal delivery is complicated with shoulder dystocia, the level of obstetric care is disputable.

Discussion

An extreme difference in assigned initially high risk is observed comparing older and younger nulliparous women and multiparous women; respectively 43.3% compared to 12.1% and 40.9% compared to 25.8% were initially high risk. Older women have a considerably higher rate of exclusively high risk compared to younger women in this cohort. The obstetric guideline, the WBK, recommended age not as indication for exclusively high risk. Essential is the rate of obstetric pathology in older women and especially pathology like intrauterine growth retardation, in which abdominal palpation as screening test has a low sensitivity in primary care.

Of all nulliparous women selected as initially high risk only 30%, and of all multiparous women 59% have risk factor(s) described in the WBK guidelines ('conform') (Table 3.2a).

A fair judgement on the distribution of observed risk factors in 'conform', 'not conform' and 'indeterminate' is limited, due to incompatibility of risk factors as coded in the LVR and those listed in the obstetric guideline.
To determine whether risk factors are related to obstetric pathology or complications, a list of risk factors should be coded following the risk factors as mentioned in the obstetric guidelines. Furthermore, obstetric pathology and complications during pregnancy and delivery should be coded with care. Risk factors and obstetric complications should be well defined. This will result in gaining evidence in the relationship between observed risk factors and obstetric pathology, incidence of occurrence and recurrence of obstetric pathology and how these risk factors will influence obstetric outcome.

The establishing of risk factors and the assignment of high risk status and secondary care have only an additional value above primary care if a personal management plan is made tailored to the specific risk factor(s).

3.2.2. High risk emerging during pregnancy

Epidemiology

In our cohort 29% (936/3280) of the initially low-risk nulliparous women were referred during pregnancy. This is 25% of the starting cohort of nulliparous women (N=3795). In multiparous women this number was 14% (420/3050), representing 10% of the starting cohort.

Distribution of observed risk factors/indications

In Table 3.3 the distribution is given of the most important indications for referral during pregnancy. The indications are clustered and the number is given as percentage of all referrals during pregnancy and as percentage of all initially low-risk women.

Prior considerations on classification of risk factors/indications for initially high risk

In most cases the moment of referral is obvious during pregnancy. In case of thre-
tuning preterm birth the moment of referral can be unclear, because the exact moment of start of labour is hard to define. In case of contractions in the preterm period, or even rupture of the membranes, it is not certain that this will progress into birth. In each individual case the real start of labour can be defined only in retrospect.

In the scope of evaluation of data sets concerning midwifery it is obviously practical to classify preterm labour as a pregnancy-related problem. The cut-off point between pregnancy- and labour-related problems is the start of term births in low-risk pregnancies under responsibility of primary care. This approach has been chosen earlier in studies of Dutch primary care [3,4,7].

In Chapter 7, we study the effectiveness of screening for IUGR by abdominal palpation and ultrasound measurements during prenatal care. Within the scope of risk selection of IUGR during prenatal care, we classified 'referred during labour' if date of referral and date of birth were the same. If IUGR occurs in a preterm delivered infant, SGA should be detected before the moment of referral to secondary care due to preterm birth.

We evaluate referral for breech presentation during pregnancy and delivery in term non-vertex lies separately.

Results

The most frequent indication for referral was hypertensive disorder in 26 and 12% of nulli- and multiparous women, respectively (Table 3.3). Suspected growth retardation was in 10% \((N=97)\) and 12% \((N=51)\) the indication for high risk. Growth retardation and hypertensive disorder are interrelated as growth retardation can be caused by hypertensive disorder. In nulliparous women 23 of 97 cases of referrals for growth retardation are caused or accompanied by a hypertensive disorder. In multiparous women six cases of 51 women referred for growth retardation were caused or accompanied by a hypertensive disorder. In nulliparous women in 28% referral during pregnancy, a hypertensive disorder is the underlying risk factor. In multiparous women in 13% a hypertensive disorder is the underlying causative risk factor.

Referral rate due to postterm pregnancy is equal in nulli- and multiparous women, about one fifth of all referrals.

Preterm birth: 138 nulliparous women were referred, in 62 cases date of delivery and date of referral were the same and therefore not threatening but incipient. Of these cases 14 delivered before 34 weeks of gestation (10%) and preterm birth could not be postponed. Of all 49 multiparous women referred due to threatening preterm birth, in 23 cases (47%) date of delivery was the same as date of referral. Eight (16%) were early preterm and preterm birth could not be postponed.

During pregnancy 22 women were referred due to fetal death, 17 in nulliparous (seven term) and five in multiparous women (one term). Of the preterm fetal deaths, seven occurred before 28 weeks of gestation.

Non-vertex presentation: In the initially low-risk group 6% \((203/3280)\) of the nulliparous and 3% \((96/3050)\) of the multiparous women delivered in non-vertex presentation. Of those, respectively 5% \((N=170)\) and 2.7% \((N=83)\) delivered term. Of these term
delivered non-vertex presentations 9% (15/170) of the nulliparous women and 16% (13/83) of the multiparous women were referred during labour. Two multiparous women delivered a breech accidentally at home (2%).

Discussion
Of all 3280 initially low-risk nulliparous women 29%, and of all 3050 initially low-risk multiparous 14% are referred for high risk during pregnancy, respectively 25% and 10% of the complete cohort.

Referral rate during pregnancy is not higher in older nulliparous women (defined as ≥35 years) compared to younger nulliparous women (Fig. 3.1b, c). This could be (partly) due to classifying this group of women as initially high risk in 43 and 41% in respectively nulli- and multiparous women.

In nulliparous women in 28% hypertensive disorder is a causative risk factor for emerging high risk, much higher compared to multiparous women (13%). Referral rate due to postterm pregnancy and abnormal presentation is comparable in both nulli- and multiparous women.

3.2.3. High risk emerging during first or second stage of delivery

Epidemiology
In our cohort 28% (927/3280) of the initially low-risk nulliparous women were referred during first or second stage of labour. This is 24% of the starting cohort of nulliparous women (N=3795) and 40% of those who start labour under responsibility of a midwife (N=2344). In multiparous women this number was 8% (257/3050), representing 6% of the starting cohort and 10% of those who were low risk at the start of labour.

<table>
<thead>
<tr>
<th>Reason for referral</th>
<th>Nulliparous women</th>
<th>Multiparous women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>929 N %</td>
<td>3280 N %</td>
</tr>
<tr>
<td>Failure to progress second stage</td>
<td>270 29.1%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Failure to progress first stage</td>
<td>209 22.5%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Meconium-stained fluid</td>
<td>190 20.5%</td>
<td>5.8%</td>
</tr>
<tr>
<td>PROM</td>
<td>121 13.1%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Fetal distress</td>
<td>109 11.8%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Hypertensive disorder/IUGR</td>
<td>4 0.4%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Abnormal presentation</td>
<td>15 1.7%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fetal death</td>
<td>5 0.5%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Other</td>
<td>4 0.3%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

na=not applicable.

Table 3.4
Indications for referral during first or second stage of labour, nulliparous and multiparous women, expressed as number and percentage of all referrals during labour, respectively, N=929 and N=257 in nulli- and multiparous women, and as percentage of the cohort of all initially low-risk women, N=3280 and N=3050.
**Chapter 3**

**Distribution of observed risk factors/indications**

In Table 3.4 the distribution is given of the most important indications for referral during labour. The indications are clustered and the number is given both as percentage of all referrals during first and second stage of labour and as percentage of all initially low-risk women.

**Results**

Failure to progress is the most important risk factor in nulli- and multiparous women, representing respectively 51 and 27% of all referrals during this stage of labour.

Of all nulliparous low-risk cases at the start of labour \((N=2344)\) in 240 cases (10%) meconium-stained fluid was recorded. In 190 cases (80%) meconium-stained fluid was the reason for referral to secondary care, in 3% fetal distress was the reason for referral and failure to progress during first stage and second stage in respectively 6 and 5%. In 3% \((N=7)\) referral did not take place.

In multiparous women at low risk at start of labour \((N=2630)\), in 120 cases meconium-stained fluid was recorded (5%). In most cases \((N=99, 83\%)\) this was the risk factor for referral, however 12 cases (10%) were not referred.

**Discussion**

At this stage we observed a high difference in referral rate between nulli- and multiparous women. Of all low-risk women who start prenatal care at midwife or general practitioner 28% will be referred during first or second stage of delivery, 40% of those who start labour as low risk. In multiparous women these results are 8 and 10%, respectively.

The most important risk factor responsible for referral during this stage of labour in nulli- and multiparous women is failure to progress; half of the nulliparous women are referred during this stage and a quarter of the multiparous women.

Meconium-stained fluid was a risk factor observed frequently, respectively 10 and 5%, in term nulli- and multiparous women with a gestational age until 42 weeks, who start labour as low risk. In nearly all cases referral due to meconium-stained fluid occurred during first stage of labour.

After referral for signs of fetal distress, a serious complication occurred in nulliparous women in 5% and in less than 1% in multiparous women, who start labour as low risk.

**Table 3.5**

Rate of initially high risk of all high-risk women in the ZAVIS cohort (1990–1995) compared to the 1993 LVR2 cohort, computed with the limit of 16 and 25 weeks of gestation, respectively

<table>
<thead>
<tr>
<th>Prenatal care start before</th>
<th>Nulliparous %</th>
<th>Multiparous %</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 weeks ZAVIS</td>
<td>20.2</td>
<td>59.5</td>
</tr>
<tr>
<td>16 weeks LVR2 1993</td>
<td>23.2</td>
<td>47.0</td>
</tr>
<tr>
<td>25 weeks LVR2 1993</td>
<td>29.7</td>
<td>59.2</td>
</tr>
</tbody>
</table>
Table 3.6
Referral to secondary care in initially low-risk pregnancies during pregnancy, first and second stage of labour, third stage and direct postpartum (pp) and puerperium, 'ZAVIS' 1990–1995 compared to LVR1 (SIG) data 1993

<table>
<thead>
<tr>
<th></th>
<th>Nulliparae</th>
<th></th>
<th>Multiparae</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ZAVIS</td>
<td>LVR1</td>
<td>ZAVIS</td>
<td>LVR1</td>
</tr>
<tr>
<td></td>
<td>N=3280</td>
<td>N=47748</td>
<td>N=3050</td>
<td>N=51412</td>
</tr>
<tr>
<td>Pregnancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>936</td>
<td>29</td>
<td>11925</td>
<td>25</td>
</tr>
<tr>
<td>Delivery 1st/2nd stage</td>
<td>927</td>
<td>28</td>
<td>14001</td>
<td>29</td>
</tr>
<tr>
<td>Delivery 3rd st./direct pp</td>
<td>94</td>
<td>3</td>
<td>1032</td>
<td>3</td>
</tr>
<tr>
<td>Puerperium</td>
<td>76</td>
<td>2</td>
<td>127</td>
<td>0.3</td>
</tr>
<tr>
<td>Not referred</td>
<td>1247</td>
<td>38</td>
<td>20629</td>
<td>43</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>420</td>
<td>14</td>
<td>7067</td>
<td>14</td>
</tr>
<tr>
<td>Delivery 1st/2nd stage</td>
<td>257</td>
<td>8</td>
<td>5348</td>
<td>10</td>
</tr>
<tr>
<td>Delivery 3rd st./direct pp</td>
<td>63</td>
<td>2</td>
<td>1426</td>
<td>3</td>
</tr>
<tr>
<td>Puerperium</td>
<td>70</td>
<td>2</td>
<td>129</td>
<td>0.2</td>
</tr>
<tr>
<td>Not referred</td>
<td>2240</td>
<td>74</td>
<td>37548</td>
<td>73</td>
</tr>
</tbody>
</table>

*Threatened preterm birth assigned as pregnancy-related problem.

In nulliparous women 59% (N=547) were referred during first stage of labour. Of those women who start second stage of labour under responsibility of a midwife (N=1964), 19% were referred during second stage of labour.

3.2.4. High risk emerging during third stage of delivery or direct postpartum

Epidemiology

During this stage of delivery only 94 cases were referred, 2.5% of the starting cohort, 2.9% of those who were initially low-risk women at start of prenatal care and 4.0% of those who start labour under responsibility of a midwife. In multiparous women these results are respectively 1.7, 2.3 and 2.7%. The primary reason usually is related to blood loss.

Table 3.7
Overall referral rates (%) during pregnancy in studies from Womerveer, OBINT (LVR1 1990), LVR1 (SIG 1993) and Zaanstreek cohort (ZAVIS)

<table>
<thead>
<tr>
<th></th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>OBINT</th>
<th>LVR1</th>
<th>ZAVIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous</td>
<td>17.6</td>
<td>23.2</td>
<td>27.2</td>
<td>28.9</td>
<td>22.5</td>
<td>25.0</td>
<td>28.5</td>
</tr>
<tr>
<td>Multiparous</td>
<td>8.6</td>
<td>12.9</td>
<td>13.9</td>
<td>13.7</td>
<td>13.1</td>
<td>13.7</td>
<td>13.8</td>
</tr>
</tbody>
</table>


*fPel, Heres Obint study, LVR1 data 1990, pregnancy-related problems, N=92491 [7].

gLVR1 (SIG) data, 1993, N=47 748 nulliparae, N=51 412 multiparae, [6], pp. 63–73.

Table 3.8
Indications for referral during pregnancy: a comparison between ‘Wormerveer’ study (WV), LVR1 (SIG 1993) and Zaanstreek cohort (ZAVIS) in nulliparous women

<table>
<thead>
<tr>
<th>Reason for referral</th>
<th>WV1+2&lt;sup&gt;a&lt;/sup&gt;</th>
<th>WV3+4&lt;sup&gt;b&lt;/sup&gt;</th>
<th>LVR1 1993&lt;sup&gt;c&lt;/sup&gt;</th>
<th>ZAVIS&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=2517</td>
<td>N=1483</td>
<td>N=47748</td>
<td>N=3280</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Postterm pregnancy</td>
<td>3.7</td>
<td>4.0</td>
<td>4.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Hypertensive disorder</td>
<td>3.5</td>
<td>8.3</td>
<td>6.5</td>
<td>7.4</td>
</tr>
<tr>
<td>Growth retardation</td>
<td>2.8</td>
<td>3.0</td>
<td>1.6</td>
<td>3.0</td>
</tr>
<tr>
<td>(Threatening) preterm labour</td>
<td>2.5</td>
<td>4.6</td>
<td>3.7</td>
<td>4.2</td>
</tr>
<tr>
<td>Abnormal presentation</td>
<td>2.2</td>
<td>1.5</td>
<td>3.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Fetal death</td>
<td>0.08</td>
<td>0</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Other</td>
<td>4.7</td>
<td>6.7</td>
<td>5.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>19.5</td>
<td>28.1</td>
<td>25.0</td>
<td>28.5</td>
</tr>
</tbody>
</table>

<sup>b</sup>Eskes Womerveer study, referral ≥20 weeks, 1977-1983, [5], pp. 59-60.
<sup>c</sup>LVR1 (SIG) data, N=47748 nulliparae, all preterm births were assigned as pregnancy-related problem, in 1993, [6], p. 70.
<sup>d</sup>Zaanstreek cohort, referral ≥20 weeks, 1990-1995.

Distribution of observed risk factors/indications
Postpartum haemorrhage and retained placenta are interrelated. Postpartum haemorrhage can be a life-threatening complication. Other indications for referral are extensive or complete tear.

Table 3.9
Indications for referral during pregnancy: a comparison between ‘Wormerveer’ study (WV), LVR1 (SIG 1993) and Zaanstreek cohort (ZAVIS) in multiparous women

<table>
<thead>
<tr>
<th>Reason for referral</th>
<th>WV1+2&lt;sup&gt;a&lt;/sup&gt;</th>
<th>WV3+4&lt;sup&gt;b&lt;/sup&gt;</th>
<th>LVR1 1993&lt;sup&gt;c&lt;/sup&gt;</th>
<th>ZAVIS&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=2478</td>
<td>N=1502</td>
<td>N=51412</td>
<td>N=3050</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Growth retardation</td>
<td>2.5</td>
<td>2.3</td>
<td>0.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Postterm pregnancy</td>
<td>1.7</td>
<td>2.0</td>
<td>2.6</td>
<td>3.1</td>
</tr>
<tr>
<td>(Threatening) preterm labour</td>
<td>1.6</td>
<td>2.5</td>
<td>1.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Abnormal presentation</td>
<td>1.3</td>
<td>1.6</td>
<td>1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Hypertensive disorder</td>
<td>1.0</td>
<td>1.9</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Fetal death</td>
<td>0.08</td>
<td>0.07</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Other</td>
<td>2.0</td>
<td>3.4</td>
<td>1.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Total</td>
<td>10.2</td>
<td>13.8</td>
<td>10.4</td>
<td>13.1</td>
</tr>
</tbody>
</table>

<sup>b</sup>Eskes Womerveer study, referral ≥ 20 weeks, 1977-1983, [5], pp. 59-60.
<sup>c</sup>LVR1 (SIG) data, N=47748 nulliparae, N=51412 multiparae, all preterm births were gathered as pregnancy-related problem, 1993, [6], p. 70.
<sup>d</sup>Zaanstreek cohort, referral ≥ 20 weeks, 1990-1995.
Table 3.10
Overall referral rates (%) during labour (first, second, third stage and direct postpartum) in studies from Womerveer, OBINT (LVR1 1990), LVR1 (SIG 1993) and Zaanstreek cohort (ZAVIS)

<table>
<thead>
<tr>
<th></th>
<th>W1a</th>
<th>W2b</th>
<th>W3c</th>
<th>W4d</th>
<th>OBINTe</th>
<th>LVR1f</th>
<th>ZAVISg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous women</td>
<td>10.0</td>
<td>10.2</td>
<td>13.2</td>
<td>18.0</td>
<td>28.2</td>
<td>30.7</td>
<td>31.1</td>
</tr>
<tr>
<td>Multiparous women</td>
<td>2.7</td>
<td>2.3</td>
<td>5.3</td>
<td>5.5</td>
<td>9.5</td>
<td>12.9</td>
<td>10.5</td>
</tr>
</tbody>
</table>

ePel, Heres Obiin study, LVR1 data 1990, pregnancy-related problems, N=92491 [7].
fLVR1 (SIG) data, N=48957 nulliparae, N=52368 multiparae, all preterm births were gathered as pregnancy-related problem, 1993, [6], pp. 63–73.

Prior considerations on classification of risk factors/indications

In multiparous women the obstetric manual ‘WBK’ advises primary care, and a hospital delivery under responsibility of primary care in case of a previous postpartum haemorrhage and/or retained placenta. As shown in Section 3.2.1 a considerable part of those women underwent exclusively secondary care for this risk factor, possibly based on more serious haemorrhage than the group assigned to primary care and hospital delivery.

Results

Of the 3280 nulliparous women who started prenatal care at the midwife, 1863 were referred during pregnancy and labour, therefore 1417 (43%) delivered under primary care. Of those, 94 were referred during third stage of delivery or shortly thereafter. Forty-seven (3.3%) were referred due to severe postpartum haemorrhage (≥1000 ml) and/or retained placenta. Of the 26 cases referred due to (partly) retained placenta, in 18 cases the placenta (part) was manually removed. Of those nulliparous women who delivered under responsibility of a midwife (N=1417) in 35 cases a severe postpartum haemorrhage occurred (2.5%).

Nearly 80% of the initially low-risk multiparous women (2373/3050) were still under primary care after delivery of the infant. During third stage of delivery 63 were referred to secondary care; 45 due to postpartum haemorrhage and/or retained placenta and in 18 cases due to extensive or complete tears. In 35 of those 45 referred due to postpartum haemorrhage and/or retained placenta blood loss during labour was ≥1000 ml. Severe postpartum haemorrhage (blood loss ≥1000 ml) is an impressive complication, but occurred only in 1.5% of those who delivered under responsibility of a midwife (N=2373).
Comparing referral due to tears in 1417 nulliparous to 2373 multiparous women who delivered under responsibility of a midwife, the relative risk (RR) for nulliparous women is 4.4 (95% CI 2.6–7.5).

Discussion

As stated in the previous section, 547 nulliparous women were referred during first stage of labour and 380 during second stage. Of those women who started second stage of labour under responsibility of a midwife (N=1797), 380 were referred during second stage and 94 during third stage or shortly thereafter. We can conclude that a considerable part (26%) were referred during these stages.

In multiparous women the obstetrical history is important, as complications like postpartum haemorrhage and retained placenta have a high risk of recurrence and in the next pregnancy hospital delivery is advised.

3.2.5. High risk emerging during puerperium

Epidemiology

Referral during puerperium occurred in 94 nulliparous and in 70 multiparous women, respectively 2.0 and 1.7% of the starting cohort.

Distribution of observed risk factors/indications

Most referrals during this period are due to neonatal problems leading to admis-
sion on the neonatal ward. In the Netherlands the mother will usually be admitted to the maternity ward for no medical reason, but to facilitate breastfeeding.

Results
Most referrals during the puerperial period were due to admission of the baby to the neonatal ward; 96% (73/76) and 89% (62/70) in nulli- and multiparous women respectively. Other indications were fever, thrombo-embolic complication, haemorrhage due to a partially retained placenta.

Discussion
Referral during puerperium stage was in the LVR cohort of 1993 0.3 and 0.2% in nulliparous and multiparous women, respectively, in the ZAVIS cohort in both nulliparous and multiparous women 2%.

This apparently small rate must be interpreted cautiously as the risk of underregistration most likely increases over time. In particular events after 5, 6 weeks will escape registration for thrombosis or retention of a part of the placenta. The risk of underregistration is less but still existent in ZAVIS, as LVR data files usually are ‘closed’ short after labour, while registration of ZAVIS data was after dismissal.

Table 3.12
Indications for referral during labour: a comparison between ‘Wormerveer’ study, LVR1 (SIG 1993) and Zaanstreek cohort (ZAVIS) in multiparous women

<table>
<thead>
<tr>
<th>Reason for referral</th>
<th>W1+2a</th>
<th>W3+4b</th>
<th>LVR1 1993c</th>
<th>ZAVISd</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=2478</td>
<td>N=1502</td>
<td>N=52368</td>
<td>N=3050</td>
</tr>
<tr>
<td>Abnormal presentation</td>
<td>0.8</td>
<td>0.6</td>
<td>0.8</td>
<td>0.5</td>
</tr>
<tr>
<td>PROM</td>
<td>0.6</td>
<td>1.5</td>
<td>2.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Failure to progress 2nd stage</td>
<td>0.5</td>
<td>0.8</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Fetal distress</td>
<td>0.3</td>
<td>0.9</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Failure to progress 1st stage</td>
<td>0.2</td>
<td>0.8</td>
<td>1.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Fetal death</td>
<td>0.1</td>
<td>0.07</td>
<td>0.01</td>
<td>0.1</td>
</tr>
<tr>
<td>Meconium-stained fluid</td>
<td>na</td>
<td></td>
<td>2.9</td>
<td>3.2</td>
</tr>
<tr>
<td>Postpartum haemorrhage</td>
<td>0.3f</td>
<td>0.8</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Retained placenta</td>
<td>0.5f</td>
<td>0.6</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Complete tear</td>
<td>0.2f</td>
<td>0.4</td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>

a Eskes Wormerveer study, referral ≥ 20 weeks, 1969-1976, [5], pp. 59-60.
b Eskes Wormerveer study, referral ≥ 20 weeks, 1977-1983, [5], pp. 59-60.
c LVR1 (SIG) data, N=47748 nulliparous, N=51412 multiparous, all preterm births were assigned as pregnancy-related problem, 1993, [6], p. 70.
* Meconium stained fluid was included in fetal distress.
* Data were gathered, while subdivision was not possible, pp. 86-88.
3.2.6. Continued primary care and home delivery

Epidemiology

Of the 3280 initially low-risk nulliparous women 1417 were not referred during pregnancy, first and second stage of labour and had the opportunity to deliver at home. Only 33% (471/1417) actually did.

Of the 2373 multiparous women who had the opportunity to deliver at home, 1246 (53%) actually did.

Distribution of observed risk factors/indications

This group of nulli- and multiparous women had the opportunity to deliver their baby at home, but the decision to deliver at home or in hospital under responsibility of a midwife is bound to be based on several considerations of midwife and/or the woman herself.

Risk factors for which the obstetric manual advises hospital deliveries under responsibility of midwife or general practitioner are previous delivery complicated by severe postpartum haemorrhage or retained placenta.

Women originating from other European countries, but even from outside, are not familiar with the phenomenon of home birth and will choose to deliver in hospital. Ethnicity defined on the base of visible (biologic) characteristics was recorded in LVR/ZAVIS.

We know from other studies that women who plan to deliver at home are highly educated, have a more distinct opinion that pregnancy and labour are fundamentally normal events, and that opinion is linked to a non-technological approach. This results in less fear for complications during labour [8,9]. However, personal attitude was recorded at the start of prenatal care, a study should be specially designed for this subject.

Although the woman starts labour in primary care having no established risk factors, the midwife still can have suspicions about some risk factors related to obstetric complications that will result in advising hospital delivery. Examples are suspected

<table>
<thead>
<tr>
<th></th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>OBINT</th>
<th>LVR</th>
<th>ZAVIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparous</td>
<td>72.4</td>
<td>66.6</td>
<td>59.6</td>
<td>53.1</td>
<td>49.3</td>
<td>43.5</td>
<td>40.3</td>
</tr>
<tr>
<td>Multiparous</td>
<td>88.7</td>
<td>84.8</td>
<td>81.8</td>
<td>81.8</td>
<td>77.4</td>
<td>73.3</td>
<td>75.7</td>
</tr>
</tbody>
</table>


*b* Eskes Womerveer study, referral ≥ 20 weeks, 1974–1976, N=869 nulliparae, N=915 multiparae [5].

*c* Eskes Womerveer study, referral ≥ 20 weeks, 1977–1979, N=718 nulliparae, N=721 multiparae [5].


*e* Pel, Heres Obint study, LVR1 data 1990, pregnancy-related problems, N=92491 [7].

*f* LVR1 (SIG) data, 1993, N=48957 nulliparae, N=52368 multiparae [6].

high birth weight, and head not engaged at the start of labour, especially in nulliparous women.

Results

Of the 1417 nulliparous women under primary care, 471 women actually had a home delivery and 946 women delivered in hospital. We compare occasional referral due to 'diminished fetal movements' or 'abdominal pain without contractions' between the hospital- and home-delivered group. In the hospital-delivered group 12% (109/946) were referred for one of these indications compared to 5% (24/471) in the home-delivered group.

In multiparous women 172 women were referred for one of these indications, 5% (68/1246) in the home-delivered group and 9% in the hospital-delivered group.

Non-European women, especially of Turkish origin tended to deliver in hospital. Of the cohort of 1417 women, 82% were of European origin. In the group of women who delivered at home 96% were of European origin, in the group of hospital-delivered women 75%. In multiparous women 83% were of European origin, 17% non-European. Ninety percent of these non-European women delivered in hospital.

Referral rate in home versus hospital delivery in nulliparous women was comparable, 10 vs 13% (Table 3.14). In multiparous women these results were 4 and 7% (Table 3.15).

3.2.7. Summarising conclusions on the selection process

Of all nulliparous women the majority, two third (67%) were selected as high risk at some moment of the child-bearing process. In multiparous women almost half (47%) were selected as high risk.

Age was an important determinant of risk selection: only 15% of the nulliparous women ≥35 years and 41% of the multiparous women ≥40 years maintained a low-risk status.

In a considerable part of women who were selected as initially high risk, the indica-

<table>
<thead>
<tr>
<th>Reason for referral</th>
<th>Delivered at home</th>
<th>Hospital delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=471</td>
<td>N=946</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Postpartum haemorrhage</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Retained placenta</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Complicated perineal damage</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Referral to paediatrician</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Not referred</td>
<td>425</td>
<td>90</td>
</tr>
</tbody>
</table>

Table 3.14
Indications for referral during third stage of labour or direct postpartum in women who delivered under the responsibility of primary care in hospital or at home, in nulliparous (N=1417) women.
tion for secondary care was not conform obstetric guidelines as recommended in the WBK [1]. These women should start prenatal care as low risk.

Referrals during pregnancy concerned mostly conditions with a higher risk for mother and child such as hypertension, diabetes, growth retardation. Referrals during labour mainly pertained to labour problems. Especially in nulliparous women, referrals during first and second stage of labour were in more than 50% due to failure to progress. But even in multiparous women more than a quarter were referred for the indication failure to progress.

Meconium-stained fluid gave high referral rate, 21% in nulliparous and 39% in multiparous women referred during first or second stage of labour for this indication.

3.3. Comparison of ZAVIS with other registry data

Quantitative comparison of referral rates with other data to some extent was possible.

Initially high risk

We compared our data of initially high-risk women with LVR2 data in 1993. The LVR2 does not give the absolute number of women who were initially high risk. This can be deduced either from ‘the first moment of care’ or ‘the gestational age at which secondary care starts’. Cut-off levels are given for 16 and 25 weeks of gestation. We choose in the ZAVIS cohort a cut-off point of 20 weeks from a practical point of view: first, the WV study [3] did the same, second, the erroneously first bookings at primary care are referred, third, multiple pregnancies are detected on routine early ultrasound and will be referred.

In Table 3.5 we give the rate of initially high risk of all high-risk women, prenatal care starting before 20 weeks in the ZAVIS cohort with prenatal care starting before 16 respectively 25 weeks in the LVR2 cohort of 1993.

In nulliparous women the ZAVIS initially high-risk group was smaller compared to the LVR, regardless the cut-off point. In multiparous women the group of initially high

<table>
<thead>
<tr>
<th>Reason for referral</th>
<th>Delivered at home</th>
<th>Hospital delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( N=1246 )</td>
<td>( N=1127 )</td>
</tr>
<tr>
<td></td>
<td>( N )</td>
<td>( N )</td>
</tr>
<tr>
<td></td>
<td>( % )</td>
<td>( % )</td>
</tr>
<tr>
<td>Postpartum haemorrhage</td>
<td>5</td>
<td>0.4</td>
</tr>
<tr>
<td>Retained placenta</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Complicated perineal damage</td>
<td>9</td>
<td>0.7</td>
</tr>
<tr>
<td>Referral to paediatrician</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Not referred</td>
<td>1195</td>
<td>96</td>
</tr>
</tbody>
</table>
Risk in our cohort was greater if we compared these with care provided by the obstetrician that started before 16 weeks in the LVR2, but equal when we compared it to the 25 weeks group. Apparently 12.2% came under care of the obstetrician between 16 and 25 weeks. We assumed this is the result of erroneous booking at the midwife; with risk factors in obstetrical history immediate referral is not necessary and collecting information takes time.

The rate of initially high risk in our cohort of nulliparous women was smaller compared to LVR2 data. Apparently, in our cohort, no overrepresentation of initially high risk was present in the group of nulliparous women. In multiparous women the part of initially high risk pregnancies was equal comparing ZAVIS and LVR2.

Referral to secondary care in initially low-risk women compared to LVR1 data 1993

We deduced these from LVR1 data in 1993. LVR1 data are comparable with those of women who were initially low risk at 20 weeks of gestation. We excluded cases that were referred directly after first examination, most likely due to erroneous booking (246 nulli- and 415 multiparous women), multiple pregnancies (respectively 311 and 458), and a history of caesarean section (815 multiparous women). Threatening preterm birth and referral due to preterm birth during labour were all assigned as pregnancy-related problems as was in the WV study and OBINT.

The effect of this switch is small: in LVR data in nulliparous women 825 women were referred during labour due to threatening preterm birth. If we transmit those 825 women to 'pregnancy referrals', all LVR pregnancy referrals increase from 11 100 to 11 925 (from 23 to 25%) and delivery referrals decrease from 14 826 to 14 001 (from 31 to 29%). In multiparous women, with 415 delivery referrals for preterm birth, the same calculation leads to an increase of 13 to 14% pregnancy referrals and a decrease of 11 to 10% delivery referrals.

Referral rates appear to be similar. The small difference in women not referred (38% ZAVIS cohort and 43% LVR1 cohort 1993) can be explained by referral rate during puerperium, 2.3 vs 0.3% in nulliparous and 2.3 vs 0.2% in multiparous women. Problems related to the puerperium, like neonatal jaundice, become apparent after the form is filled in. Therefore the difference is most likely due to the known postpartum underreporting in the LVR [7].

3.3.1. Qualitative comparison of referrals with other data

The only national data on risk selection are from Smits. He described the results of the risk selection process in a regional cohort (Enschede) in 1974 [2]. Recommendations for exclusively secondary care used during that period were described by Kloosterman [10] (the precursor of the official WBK list). A considerable part of low-risk cases (22%) were present in the initially high-risk group.

Alas, national data are not yet available. But we can conclude that in Enschede in 1974 and in the Zaanstreek study (1990–1995), the allocation of indications for exclusively secondary care was considerably different from the guidelines. We can debate
whether the national data are better. The ZAVIS rates of exclusively primary care are remarkably alike the Dutch national data (Table 3.5). We have no reason to believe that in other regions in the Netherlands the situation will be better. In our Zaanstreek region, the obstetricians and midwives have a good professional relationship in a well-established collaboration, with a monthly perinatal conference of obstetric pathology (general practitioners do not perform obstetric care). We believe it is disappointing that in spite of such a collaboration, the amount of protocol violations regarding the medical indications, especially for initially high risk, should be that high.

3.3.2. Time trends

Comparison of referral of pregnancy-related problems

Table 3.7 shows a historical view on referral rates during pregnancy, using the data of the WV study 1969–1983, OBINT 1990, LVR (SIG) data 1993 and ZAVIS cohort 1990–1995. We compiled the LVR (SIG) data conform the Wormerveer (WV) study, ZAVIS cohort and OBINT study.

During the period 1974–1995 the referral rate during pregnancy in multiparous women was more or less stable. The referral rate in nulliparous women increased within the WV study in 1969–1983. Comparing ZAVIS and WV study period 1977–1983 referral rate in OBINT and LVR (SIG) cohort was somewhat lower.

To evaluate the higher rate of referral in nulliparous women in the WV study and ZAVIS cohort the indication for referral was essential. In Tables 3.8 and 3.9 we compare the indication of referral in nulli- and multiparous women with LVR (SIG) data of 1993. Unfortunately, it was not possible to compare with OBINT data, because OBINT did not distinguish between nulli- and multiparous women.

If we combined referral rate due to hypertensive disorder and growth retardation, a highly interrelated disorder in pregnancy, referral rates in WV study 1977–1983 and ZAVIS cohort were comparable, and referral rate in LVR1 cohort was somewhat lower. An explanation for a small referral rate in the WV study period 1969–1977 could be that in this period fetal surveillance had not yet been introduced. In this period hypertensive disorder was the reason for referral on maternal indication. The introduction of fetal surveillance by cardiotocography as common practice resulted in a higher referral rate due to hypertensive disorders like pregnancy-induced hypertension (PIH) and especially growth retardation.

The relatively high referral rate due to postterm pregnancies and abnormal presentation in the ZAVIS cohort was remarkably. This could be partly explained by a higher referral rate during pregnancy for abnormal presentations compared to referral during labour.

As referral rate in multiparous women was comparable in all studies we expected the same referral rates of pregnancy-related problems (Table 3.9).

In the ZAVIS cohort more multiparous women were referred due to growth retardation, postterm pregnancy and abnormal presentation, but no great differences were recorded. The increase in the referral rate for postterm pregnancy is to be explained by
the change of the line between term and postterm pregnancy from 43 to 42 weeks in 1987.

Comparison of referral for labour-related problems

Table 3.10 shows a view on referral rate during labour in historical perspective. The increase of referrals is impressive, especially in the last decade.

Table 3.11 shows that in nulliparous women referral due to failure to progress during first stage of labour increased enormously; from 1–2% in the WV study to more than 6% in LVR1 and ZAVIS cohort. Less remarkable is the rise in referral due to failure to progress during second stage, from 5 to more than 7%.

In the WV study referral due to fetal distress and meconium-stained fluid were combined. In the WV period meconium-stained fluid was not in general an indication for referral. Referral rate for these indications increased enormously from 2% in WV study 1969–1976 to 7 and 9% in respectively LVR and ZAVIS cohort. The question remains whether fetal distress occurred more often in later years, or that criteria or their application sharpened up.

Continued primary care during pregnancy and labour

If we subtracted the referrals both during pregnancy and labour from the group initially low risk (Table 3.13) we observed in historical perspective that the rate of women remaining in primary care decreased enormously, especially in the last decade of our study, particularly in nulliparous women. This decrease was mainly due to the increasing referrals during delivery, and then again mainly to the indications ‘failure to progress’ especially in first stage and ‘meconium-stained fluid’.

Comparison of home delivery with national data

After 1945 the percentage of home deliveries decreased continuously. In the early 1970s the percentage fell below 50% and in 1978 it had decreased to 36%. Then this decrease came to a halt: In 1987 34% of the infants were born at home [11].

In 1993 56% delivered in hospital under responsibility of an obstetrician, and 44% under responsibility of a midwife or general practitioner. Of these 44%, 31% delivered at home and 13% delivered voluntarily in hospital [6]. These percentages are estimates calculated from the number of children born according to Statistics Netherlands (CBS) and LVR data.

In our cohort of nulliparous women 417 delivered at home: 11% (417/3795). Of all multiparous women 1127 delivered at home: 27% (1127/4234).

The result for all women is 19% (1544/8029), low compared to CBS–LVR data of 1993.

In 1995 32% of all women delivered at home, and this result declined to 30% in 2000 [13].

As in the Netherlands the rate of home deliveries is stable (~ 30%), while the rate of referrals during pregnancy and labour is increasing, the number of women choosing for a home delivery must have risen substantially.
3.4. Conclusion

The risk selection process is not only an incidental judgement at the start of prenatal care (or some later point during pregnancy), but a permanent process to determine the risk status of women during pregnancy and labour. Surveillance may be the more appropriate term to cover these risk-judging activities of midwives and others. The core of this professional key activity of primary care is the repeated determination of a personal risk profile for each woman. What is an increased risk? A higher than average (or some norm) probability for obstetric complications? A 'substantial' risk for adverse fetal or maternal outcome? Following Jungner and Wilson [14] the criterion (strictly) high(er) risk alone is insufficient to justify subsequent secondary care. Only if preventive, diagnostic or therapeutic options are available, secondary care is indicated.

Of all nulliparous women recorded in the ZAVIS cohort 67% ends up in secondary care, of all multiparous women 47%. As said above, comparison of these data with national primary care (LVR1) and secondary care (LVR2) reports is limited by the absence of combined registry data of LVR1 and LVR2. A first recommendation would be the creation of such integrated primary-secondary care data sets.

The obstetric manual states national guidelines, which were derived from the previously mentioned Jungner and Wilson principle. Consensus about these guidelines exists among the professional associations involved.

Evaluation of risk factors, the potential for diagnosis, preventive measurements, and treatment, is relevant to present more specific conclusions on risk selection according to the stage of pregnancy.

Generally in ZAVIS we observed poor agreement between the guidelines in the obstetric manual, and the actual risk assignment, especially in assigned initially high-risk women.

Initially high risk, nulliparous and multiparous combined

Of the complete cohort of nulliparous women 14% were initially high risk, and of the multiparous women 28% (Fig. 3.1a). Compared to national LVR-SIG data (LVR2) in nulliparous women the rate of initially high-risk pregnancies was quite equal to our ZAVIS cohort (Table 3.3). In ZAVIS at least 47% of the observed, assigned indications for exclusively secondary care (initially high risk at 20 weeks of gestation) was not conform the guidelines of the obstetric manual (Table 3.2a–c).

Likewise the percentage of initially high risk in multiparous women seems comparable with SIG data (Table 3.3), with at least 26% of indications not conform (Table 3.2a–c).

In our Zaanstreek region the various obstetric professionals have a good professional relationship in a well-established collaboration, with a monthly perinatal conference of all cases of obstetric pathology. We think it is disappointing that in spite of such a collaboration the amount of protocol violations regarding the medical indications, especially for initially high risk, is that high. Furthermore we have no reason to
believe that in other regions in the Netherlands the situation is better, as our figures of risk assignment are quite comparable with the national figures.

Surprisingly neither professional representatives, nor insurance companies apparently show interest in the practice of risk assignment. From the perspective of midwives this is surprising as the Dutch system is based on low-risk surveillance; from the viewpoint of insurance companies this is surprising in view of the generally higher costs of secondary care.

We conclude that national guidelines on risk assessment before 20 weeks of gestation do not reflect practice, with few opportunities to analyse this discrepancy, while few incentives exist to do so.

Given the rather simple changes required to document adequately risk status in initially high and low risk, we strongly advocate to change the current registry forms (LVR1 and LVR2 form) to cover both guideline-based and additional risks at the start of prenatal care. We are aware that the observational context of this registry puts limits to the potential for evaluation of the adequacy of guideline-based and additional risks at booking, but at least important areas for development of evidence may be discovered by this improved documentation.

Initially low-risk nulliparous women, referral to secondary care

Of all 3280 initially low-risk women, at 20 weeks of gestation, a similar rate of women were referred during pregnancy and labour, respectively 29 and 31%. Compared to national data (OBINT and LVR1 1993) referral rate during pregnancy is higher, while referral rates during labour are in the same range. Time trends do not show a substantial change in referral rate during pregnancy, except an increase in referral compared to 1970 (Table 3.7). Referral rate during labour (Table 3.10) increased over the years from 10% in 1970 to 31% in 1993.

Proposed reasons for this increased referral rate during pregnancy:

- Changed evidence on the weight of already known risk factors, e.g. increased referral rate due to pregnancy-induced hypertension not on maternal indication, but based on the increased possibilities of fetal surveillance. Furthermore higher referral rate due to abnormal presentation as ultrasound diagnosis has been common practice since 1970.
- An actual increase of risk factor prevalence (given age) of those becoming pregnant, in particularly of hypertensive diseases, smoking, and perhaps diabetes.
- Changed attitude towards essentially the same risk factors by both the client (more informed, assertive women demanding ‘enforceable health’, a guaranteed 100% healthy baby) and the professional (defensive obstetrics).

We have shown above that selection until labour, during pregnancy has been more rigid, hence one expects an extremely low-risk rest population. But the referral during labour of women who still were low risk at onset of labour, has risen from 10% to a staggering high 30%. Major determinants were failure to progress in first and second stage.
Proposed reasons for this exploded referral rate are:

- The improved diagnosis of existing risk factors and recognition of hitherto unknown risk factors, like premature rupture of membranes related to intrauterine infection. Meconium-stained fluid is assigned and more frequently applied as risk factor for fetal distress since 1987.
- An increased risk of dystocia and instrumental delivery in higher age.
- Changed attitude towards essentially the same risk factors by both the client (women becoming generally more impatient, ‘older pregnant women’, and women pregnant after treatment for infertility put more pressure on having caesarean section to ‘avoid’ risk) and the professional (more defensive, more time sensitive, more client oriented).

A thorough analysis of this increase in particular is justified, as few firm and evidence-based guidelines exist on the issue.

Initially low-risk, referral to secondary care, multiparous women

Referral rate during pregnancy in multiparous women is in the period 1977–1995 around 13%. The referral rate during labour increased from 5 to around 12% in this period.

Proposed reasons for this increase in referral rate are:

- The improved diagnosis of existing risk factors and recognition of hitherto unknown risk factors. Meconium-stained fluid has been assigned as risk factor for fetal distress since 1987.
- Changed attitude towards essentially the same risk factors by both the client (impatience, more pressure on having elective caesarean section after previous complicated assisted vaginal delivery) and the professional (more defensive, more time sensitive, more client oriented).

Home delivery

National data of LVR in 1993 estimated that 31% of all women deliver at home [6]. In our cohort this was 19% (Tables 3.14 and 3.15). Ethnicity is one of the explanations for this difference.

National data show a more or less stable rate of home deliveries (in 1987 34%, in 1993 31% and in 1995 32%), while the referral rate to secondary care increased, which must have resulted in a substantially increasing number of women choosing for home deliveries.

Recommendations:

- Creation of integrated primary and secondary care data sets, linking of LVR1 and LVR2.
• Similarity between the risk factors in the obstetric manual and in the LVR registration.
• Determination of risk factors for each pregnant women conform risk factors mentioned in the obstetric manual in both primary and secondary care, which will gain more insight in the relationship between risk factor and obstetric complication(s).
• If the Dutch two-tier system is to be maintained, all efforts should be put to force back the exploding referral rate of nulliparous women during labour. Popular information on delivery tends to be too sensation seeking and unrealistic, focussing mainly on the second stage while neglecting the long and tedious first stage. Guidance and support during this first stage (in contrast to the current opinion among some midwives) is of major importance [12]. Referral from low to high risk during labour, a unique concept in the Netherlands, is a perfect setting for investigation of such support and if this results in a lower referral rate a broad-scale program can be advocated.

References
