

Universal Neonatal Hearing Screening in The Netherlands

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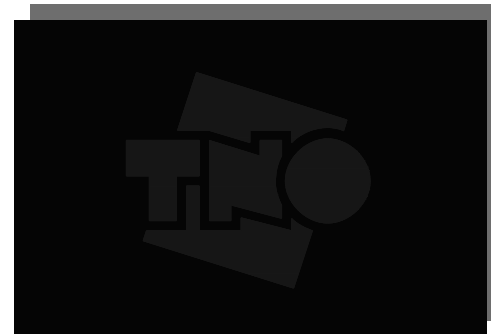
Acknowledgments

- This work is also based on work by and with

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The Netherlands: stats

- Small EU country:
 - Capital: Amsterdam
 - Population: 17 million
 - Very high population density
 - Annual birth rate 200.000
- home birth for 30-35% of neonates, under guidance of midwife or GP
- >90% is at home at age 24 h
- All people: insurance covered for individual health care costs

Existing UNHS relevant curative health care

- Insurance paid
 - General Practitioners: every baby has one
 - Specialists: ENT, Pediatrics, Audiological Centers, Family Guidance Services for deaf infants
 - A Hospital Based HS-program for NICU-babies
 - Comprehensive hearing assessment of infants and children is done in Audiological Centers only
- For reimbursement of cost of Audiological Assessment a formal referral by a GP/ENT/Pediatrician/Neurologist is required

Existing UNHS relevant preventive health care

- Tax paid, community based
 - A Well Baby Clinic system for monitoring infant development
 - including >95% of the infants in first yr of life
 - Taking blood sample at day 4-7 (PKU,..., screen) in most of the districts, all counties but Gelderland and Zuid-Holland
 - Carrying out the **EXISTING UNIVERSAL SCREEN** at age 9-12 m
- As the WBC doctor is “preventive” he/she has no authority to refer to an Audiological Center for hearing assessment

UNHS: problems to be solved when we were at it in 1994

- Getting a high quality screening program: ideally
 - 100% coverage of the neonatal population
 - 100% inclusion
 - 0% loss in the screening program
 - Program sensitivity and specificity 100%
 - Diagnostic assessment
 - In 100% of the refers
 - Before the age of 13 wks
 - Intervention to be started before age 26 wks

UNHS: problems to be solved when we were at it in 1994

- Who must be responsible/in charge of
 - the program?
 - it's follow-up?
 - it's quality monitoring?
- A labyrinth of financial and status interests of
 - GPs, ENTs, Peds, ACs, Epidemiologists, ...
 - This labyrinth is different in every country and even between districts

The “Who is in charge?” problem

- Our old/present UHS-program is of low quality:
 - Coverage about 80 %
 - GPs
 - are not impressed by a refer outcome (6% of the babies, virtually all false positive),
 - “wait and see” policy
 - When referred, if parents insist or complaints are clear,
 - then to an ENT/Ped
 - not able to do hearing assessment themselves
 - after a delay referral for hearing assessment will follow if parents insist or complaints are clear
 - Delay between “refer” and hearing assessment 9 months

Solutions were found in trials during 1995-2001

- Screen tests and equipment for cEOAE/A-ABR/A-cEOAE/A-DPOAE?
- Test-sites: home and/or WBC?
- Test-age: 4-7 d, wk 2-4?
- Test staff: 1st or 2nd level WBC nurses?
- Program
 - Models: 2*cEOAE/2* A-ABRF/.....?
 - Automated administration?
 - District dependant variants?
- Referral models (who is in charge?)

Solutions: who is in charge?

- It is reasonable and effective if those who have already access to the population are also responsible for the UNHS: the WBCs.
- It is reasonable and effective if a “refer” outcome is followed by hearing assessment at no delay
- WBCs
 - are responsible for the program and it’s quality monitoring
 - take care that hearing assessment is done in all referred babies
- The GP authorizes the refer for hearing assessment afterward

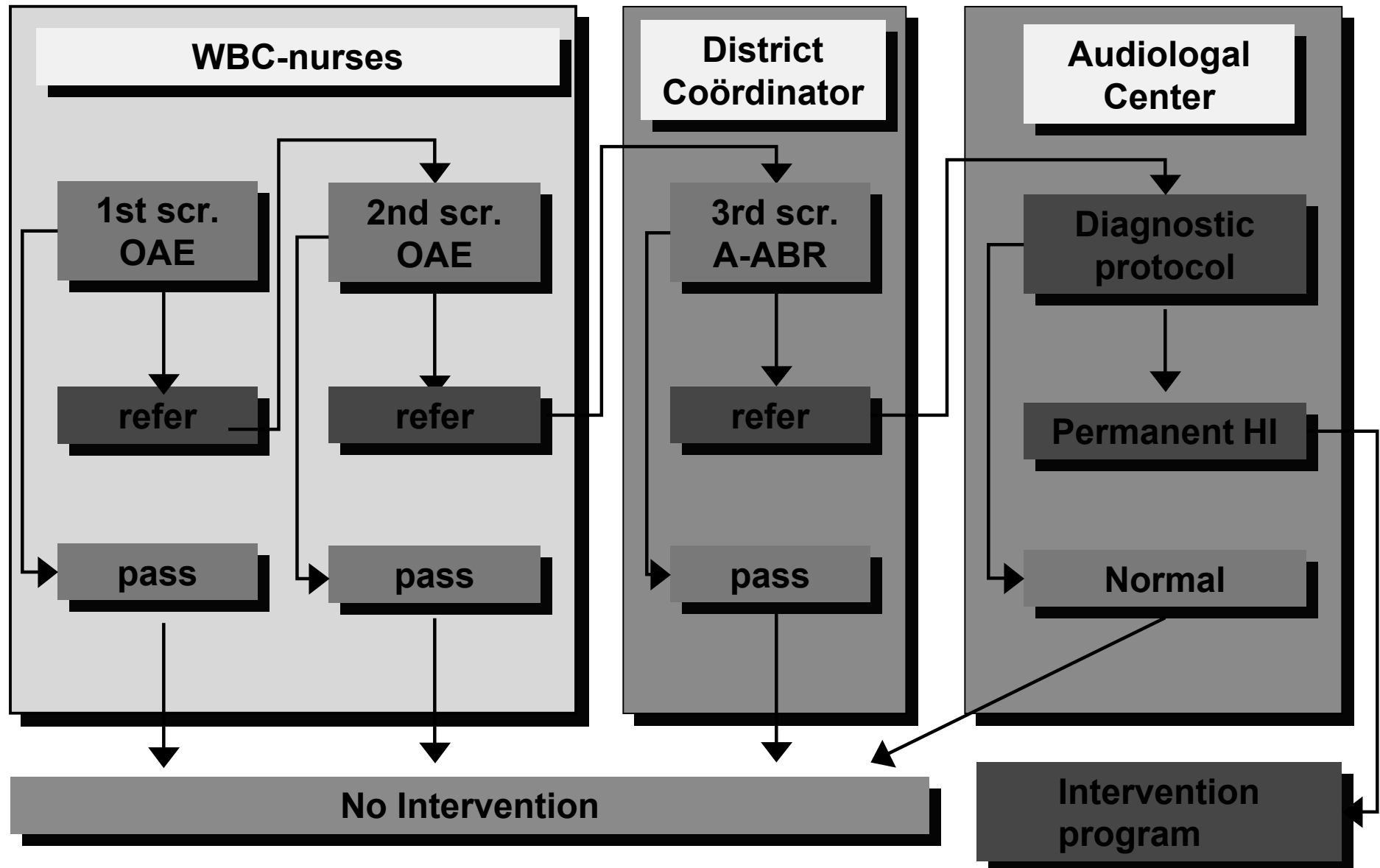
Quality criteria to be met by WBCs

Q-Aspect	Test 1	Test 2	Test 3	relative
Coverage	> 95 %	>92 %	>90 %	population
Refer rate	< 7%	< 3%	< 0.5%	population
Age	< 4 wks	< 5 wks	< 6 wks	
Age at referral				< 7 wks
Age at 1st hearing assessment				<10 wks
Age at start intervention				< 26 wks

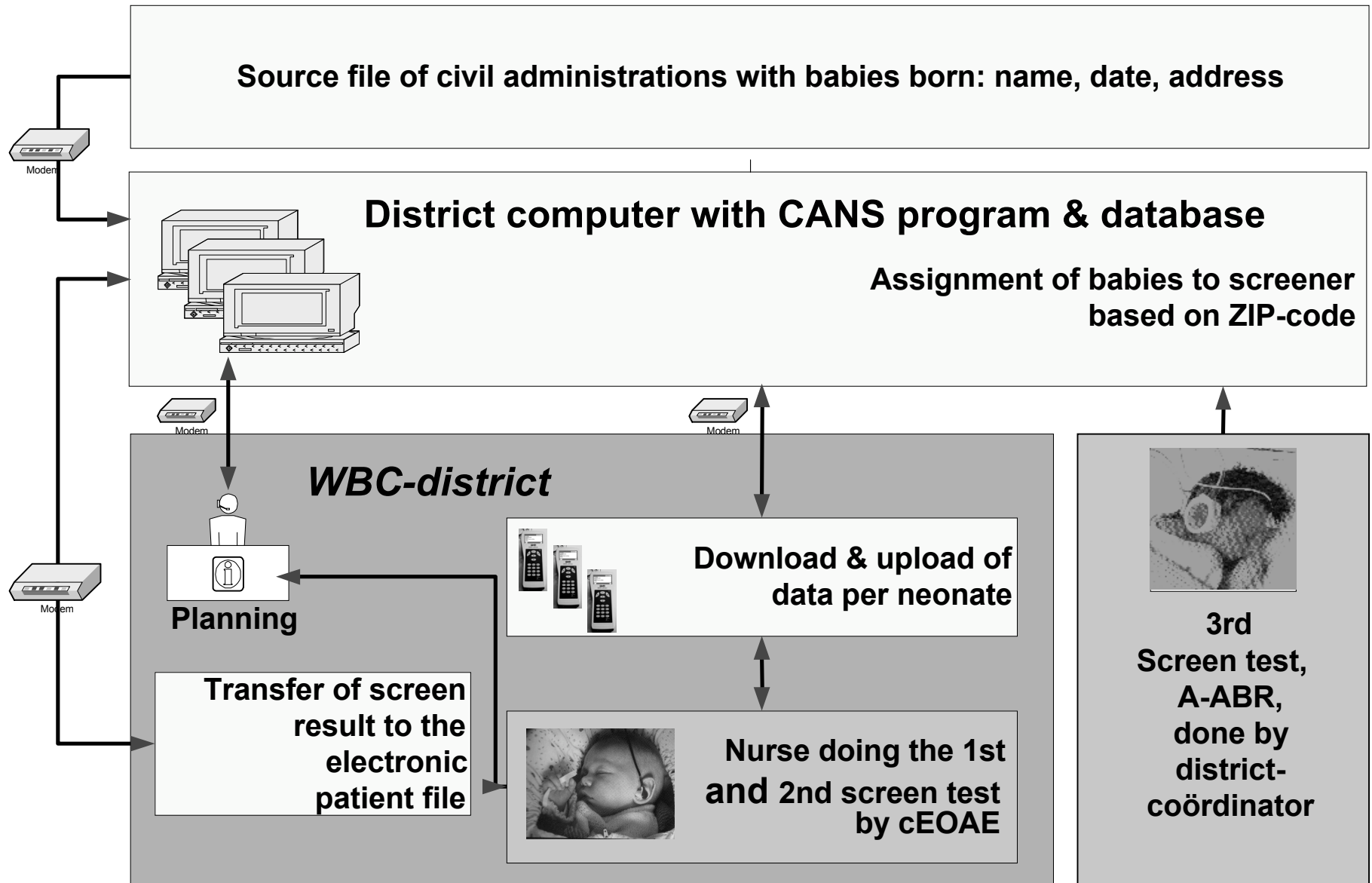
Solutions: program variants

- Program 1:
 - Test 1 at home, in day 4-7 (combined with the blood sampling)
 - Test 2 at home, in day 11-14
 - Test 3 at home, in day 18-21
- Program 2:
 - Test 1 at WBC, in week 3
 - Test 2 at WBC, in week 4
 - Test 3 at home, in week 5
- Program 1&2
 - First two screen tests, A-OAE, done by WBC nurse
 - Last test, AABR, done by WBC-district screen coördinator

UNHS program in implementation districtwise 2002-2006



Logistics of the program

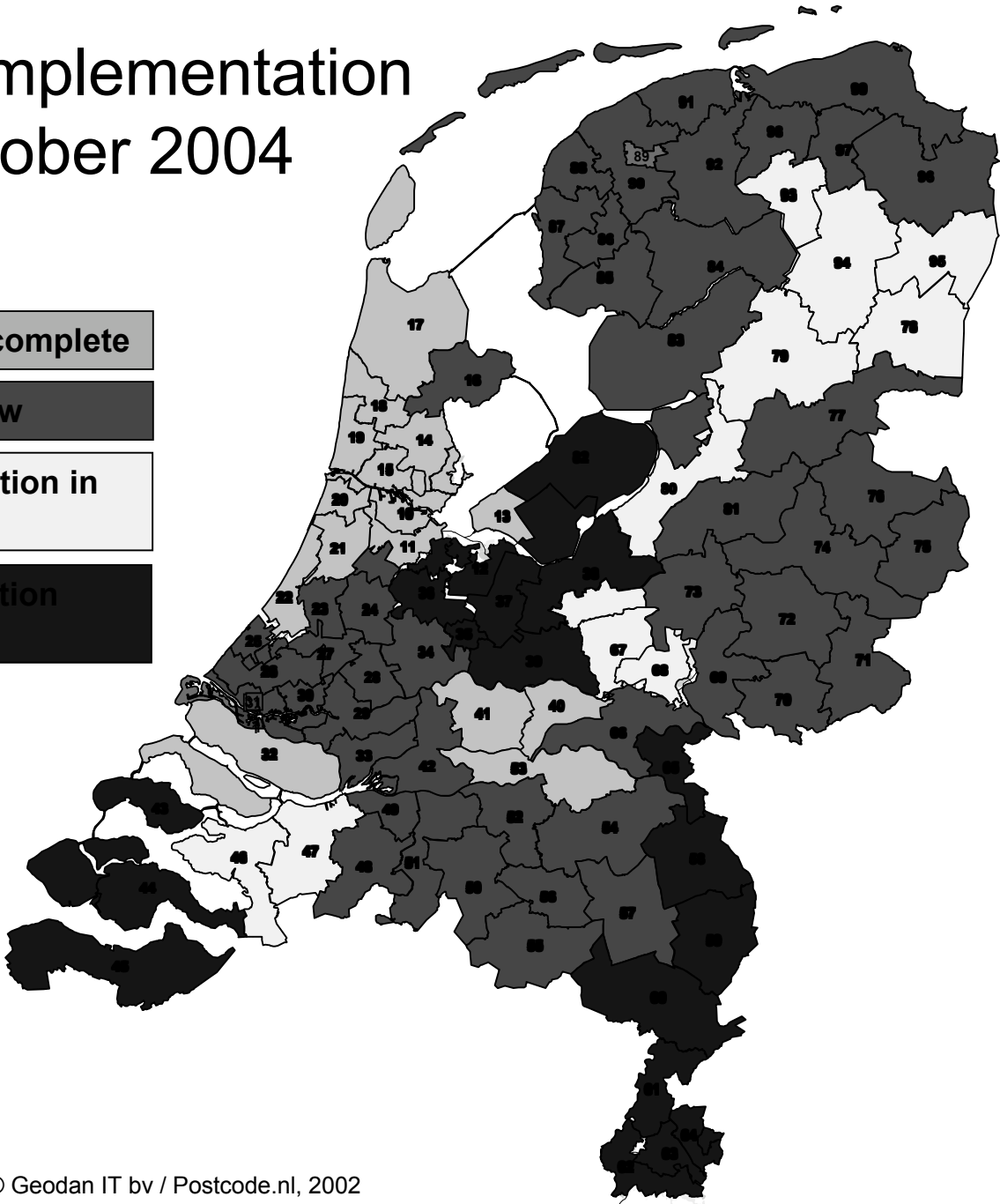


Logistics on national level

- A 'national' computer system logs on into the district computers
 - To poll the database and get aggregated data
 - To make changes to the CANS-program
- Audiological Centers report back to the national system

Status of implementation by October 2004

- Implementation complete
- Implementing now
- Start implementation in 2004
- Start implementation planned for 2005



Results by april 2004 (varying period/district)

2 stage A-cEOAE + 1 Stage A-ABR screening program	3-stages at home	2-at WBC 1 at home	Total N or %, %
population to be screened	39936	14106	54042
still in screen	374	899	1273
% of population NICU already screened	1,27	1,27	1,27
candidates for WBC screen	39055	13027	52082
% not included stage 1	1,75	2,97	2,05
direct to 3rd screen-stage	28	8	36
% included in 1st stage	98,18	96,97	97,88
% passed at 1st stage of included in 1st stage	94,31	90,63	93,40
% failed at 1 stage of included in 1st stage	5,69	9,37	6,60
% lost for 2nd stage of all candidates	0,11	0,32	0,16
after 1st stage direct to 3rd screen stage	27	16	43
% failed at 2nd stage of included in 1st stage	1,50	3,49	2,00
% lost for 3rd stage of included in 1st stage	0,02	0,05	0,03
% of included 1st stage finally failing screen: refer rate	0,19	0,28	0,21
Referred	75	36	111

Diagnostic outcome

- 41 cases still in process
- But, figures below calculated by imputation from cases done

Screening outcome	Unilateral refers	Bilateral refers	Total Refers N	Screened %
%	65,8	34,2	111,0	100,0 (52082) 100
Diagnostic outcome				
Normal	41	14	54	48,6
Permanent Conductive Loss	6	5	11	9,9
Sensorineural Loss	21	17	38	34,2
Mixed Loss	5	2	7	6,3
Total	73	38	111	

Summary

- In the typical Dutch neonatal conditions hearing screening can be done
 - Preferably at home
 - But also in the WBC, with a limited loss of quality
 - With a coverage $> 97\%$ and refer rate $< 0.3\%$
- The recommended model is now a 3 stage screen:
 - 2* automatic OAE-screen
 - Last stage automatic ABR screen
- Notes:
 - Equipment shows still development
 - Other equipment will be evaluated and
 - Models with a better performance may be found