

# 8SF OBUBMDSF F OJH BOE EJBHOPTUDUFTUJOH QPS GFUBM DI SPN PTPN BMBOE HF OFUD DPOEJUPOT

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7 CKFDUMFT (FTU\_ MOY OZ` U UZ` OZPOP` [ \Y[ bUPO  
NPbUQ[ Z `TO`OQ[ Y Y OZPOP\_ O`OZUS NZP  
PUMSZ[ M



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#ž BMlQZ`\_aY Y Me#####&  
\$ž EaY Y Me [ R'Qq Y Y OZPMUj Z\_#####(  
%ž 6UQa\_ Uj Z NIP ^Qq Y Y OZPMUj Z\_#####"  
%ž# B^OZMNK`Q`\_R` ^OT^Y [ \_] Y QNlCa\X UPlQ\_#####

3\OZPld 0 ///\$+  
3\OZPld 3 k G\PMUZS 5[Y Y U'OO? OY NO^TU/\$" #\* Z\$" #+f///\$+  
3\OZPld 4 I [Y OZh: QXT 5[Y Y U'OO? OY NO^TU ///\$+  
3\OZPld 5 AbQ'blOc [R'TQ6CbQ\Y OZ` MZP DcbOc B^'OO\_R ^'TU\_E'MOY OZ` ///\$-  
3\OZPld 6 8aX6UOXMY O^ ///%  
3\OZPld 7 5[Z\_UPO'MUJ Z\_R ^;ZPISOZ[ a\_MZP 5aXa^NMe MZP >ZSaU`ONMe 6UbO^QB[ \aXVIJ Z\_ ///#  
3\OZPld 8 6U[ ^PO^\_4MCP [ Z 7 TZUJe ///\$  
3\OZPld 9 6CRZUJ Z\_MZP 3NN^CbUMJ Z\_ ///%

7bQ'e NNMle TM M\_Y NKO TN CO [ RTNBUZS MOT^Y [ \_] Y MX [ ^SOZO WQ ZPUU Zz B'OZMINX\_O'OOZUS R^ ^  
\_] Y OOT^Y [ \_] Y NNP SOZO WQ ZPUU Z\_U [ RRO^CP Pa^US \^OSZM Oe^ [ \^ bUPO^TQc [ Y M c UT  
Y [ ^OZR^ ^Y MU Z MN [ a^ TO^aZN [ ^Z NMež 3X\_aO^`Q\_`US \_] [ aP NOVPMOUBSZ MIP [ Zx aZPO^MVOZ  
c TOZ `TQc [ Y M TM NCOZ UR^ ^Y CP MN [ a^ `TOZMa^O [ R^TO\_O'OOZUS `Q\_`TQ [ \_UNO^Q\_aX\_`MIP  
`TO [ \^U Z\_NbNKO^ [ TOž

FTONMlW\^ZOUXQ [ R\^OZMINX\_O'OOZUS U\_ [ [ RRO^M MPO CROUWONIP MOO\_UNO^Q\_`UZ [ ^PO^ [ ^  
UPOZ`Ue c [ Y OZ c UT M UZ O'OMCP OTN CO [ RTNBUZS MNMle c UT MOT^Y [ \_] Y MX [ ^SOZO WQ ZPUU Zz  
FTQ\_Qc [ Y OZ MO^TOZ R^ X^ c CP a\ c UT SOZO WQ aZ\_OXZS MIP [ RRO^CP PUSZ [ \_] W^Q\_`US R^ ^MPCRUO  
M c Ož 5a^OZ`X [ Zx M UZbM UO^Q\_`OSZM^ ZU OZ^Q\_U [ ^OT [ ^U ZWbU^ \_M^ \XZSfION PUSZ [ \_OM  
SOZO WQ [ ^OT^Y [ \_] Y MX Q ZPUU Z UZ M aZN [ ^Z

FTU\_`MOY OZ`\_aY Y MUQ\_`OQ Y Y OZPMUJ Z\_R\_`^`OZMINX\_O`OOZLS R\_`^O`^Y [ \_] Y N`NIP SOZO W  
Q ZPUJ Z\_R\_`^`OSZNI` c [Y OZ NIP`TQ`M ZO`\_U`TOSOZON`N\`a`XUJ Z`i [ Y OZ c UT N`L U`O`MCP  
O`N`OQ [ RTN`LZS MOTU`P c UT MOT`^Y [ \_] Y N`X [ ^SOZO WQ ZPUJ Z`/O`S`Z`TN`LZS`TNP`M`N`N`e c UT M  
Q ZPUJ Z [ ^PaQ` [ M`R`Y U`E TU` [ ^e [ RMQ ZPUJ Z`fi`T [ a`P`^`O`O`L`O`Z`P`U`P`a`M`U`CP Q`aZ`O`X`Z`S`R` [ Y M  
O`Z`L`O`N`Z c UT M`^` [ ^`U`M`O`Q`a`N`O`^`U`Q`^`O`R`O`M`N`E`^`U`^` [ ^`OSZNI`O`e`z

1/

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3000`MNDQRA`ŽXZO_0'OOZUS`Q`_RĚ^OT^Y [ _]Y OQ ZPUU Z_Ů _OQ ZP`^Y Q`Q'UZ0&PQ MiiY MOZNX_Q'aY _0'OOZUS/? 3 ě 38B ě j : 59 ě G7% ě ! Ž; ZTUNZfiNŮPI NfiOR6@3ŽNMCP_0'OOZUSž FTOQ[ \Ů] Z [ ROR6@3ŽNMCP_0'OOZUS M_M_OQ ZPŽ Ľ^`Q` _] [ aX NQ PUQa__OP c UT NŮc [ Y OZ M	5[ Z_OZ_a_ŽNMCP ^OQ Y Y OZPMU Z
: FDPN N FOE BUJO\$	/ SBEF BOE TVOOPSUOH SFGSFOFT

FTOQ[ \Ů] Z [ ROR6@3ŽNMCP\_0'OOZUS M\_M\_OQ ZPŽ Ľ^`Q` \_] [ aX NQ  
PUQa\_\_OP c UT NŮc [ Y OZ M





+BSSFSTDSFFOJHQP SJQI FSJFE HFOFUDEJTPSEFST	
/ PPE OSBDUJDF OPUF	/ SBEF BOE TVCOOPSIJH SFGSFODFT
B^OQ ZOO^UJ Z _O^OOZUS U \^O^O^M^O^ [ M^OZ^M^M^O^O^OZUS R^ ^ TO^UM^O^SOZ^O^O^O^ ZPUUJ Z _M^ TU \^ O^ U^M^M^ c _Y [ ^O [ \^ U^ Z _R^ ^ O^M^O^Q^ a \X^ J^ Z O^ P^ U^ S^ \^ O^ Y^ \^ X^ M^ U^ J^ Z SOZ^O^O^P^ U^ S^ Z [ _U^ Z	9 [ [ P \^ M^ O^ U^ O^ Z [ ^ O^ /O^ Z _O^ _a_ Ž^ N^ M^ O^ P^ fi
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3X^Q^ a \X^ U^ Z O^ P^ U^ S^ \^ T^ M^ O^ O^ U^ P^ O^ Z [ ^ c T [ M^ O^ \^ O^ S^ Z^ M^ \^ T [ a^ P^ T^ M^ O^ M^ O^ M^ O^ R^ X^ R^ V^ U^ T U [ ^ e^ M^ O^ Z^ c^ U^ T^ M^ O^ c^ \^ [ U^ P^ O^ Z^ U^ R^ U^ S^ \^ O^ M^ U^ O^ _c^ U^ T^ TO^UM^O^SOZ^O^O^O^ O^ P^ U^ J^ \^ P^ O^ _Z^ F^ T [ _O^ U^ P^ O^ Z^ U^ R^ O^ P^ c^ U^ T^ M^ R^ V^ U^ T U [ ^ e [ R^ M^ _O^ O^ U^ O^ U^ T^ O^ U^ O^ P^ U^ J^ \^ P^ O^ _T [ a^ P^ N^ O^ [ R^ R^ O^ P^ \^ O^ R^ M^ M^ [ M^ S^ O^ Z^ O^ O^ Q^ a^ Z^ O^ X^ Z^ S^ O^ b^ O^ R^ \^ U^ Z^ R^ \^ Y^ M^ U^ J^ Z^ M^ U^ a^ O^ M^ O^ \^ O^ O^ Z^ U^ S^ M^ Z^ P^ \^ O^ Z^ M^ M^ P^ U^ S^ Z [ _U^ \^ O^ Y^ \^ X^ M^ U^ J^ Z^ S^ O^ Z^ O^ O^ P^ U^ S^ Z [ _U^ R^ \^ T^ O^ Q^ Z^ P^ U^ J^ Zž	5 [ Z _O^ _a_ Ž^ N^ M^ O^ P^ \^ O^ Q^ Y^ Y^ O^ Z^ P^ M^ U^ J^ Z
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5M^M^O^ \^ O^ O^ Z^ U^ S^ R^ \^ T^ O^ Y [ ^ O^ Q^ Y^ Y [ Z^ O^ Y [ Z [ S^ O^ Z^ O^ P^ S^ O^ Z^ O^ O^ O^ Z^ P^ U^ J^ Z _ /O^ S^ Z^ O^ e^ _L^ O^ R^ M^ \^ U^ \^ _L^ Z^ M^ Y^ a^ _O^ a^ X^ M^ M^ \^ \^ T^ e^ L^ R^ M^ S^ U^ O^ J^ _e^ Z^ P^ \^ Y^ O^ T^ M^ O^ Y^ N^ S^ X^ N^ U^ Z [ \^ M^ T^ O^ /f^ i^ U^ N^ M^ M^ M^ O^ U^ Z^ 3a^ _\^ M^ M^ M^ P^ U^ Z^ @^ c^ L^ O^ M^ M^ P^ /U^ \^ T^ O^ \^ U^ M^ O^ _O^ [ ^ Z^ Z^ R^ \^ Y^ M^ U^ J^ Z [ Z^ O^ M^ O^ \^ O^ O^ Z^ U^ S^ R^ \^ T^ O^ Y [ ^ O^ Q^ Y^ Y [ Z^ S^ O^ Z^ O^ O^ Z^ P^ U^ J^ Z _\^ T^ M^ M^ R^ O^ O^ U^ P^ O^ Z^ /O^ S^ Z^ O^ e^ _L^ O^ R^ M^ \^ U^ \^ _L^ Z^ M^ Y^ a^ _O^ a^ X^ M^ M^ \^ \^ T^ e^ L^ R^ M^ S^ U^ O^ J^ _e^ Z^ P^ \^ Y^ O^ f^ i^ T [ a^ P^ N^ O^ [ R^ R^ O^ P^ \^ M^ K^ c [ Y^ O^ Z^ \^ X^ M^ Z^ U^ S^ M^ \^ O^ S^ Z^ M^ O^ e [ ^ U^ \^ T^ O^ R^ U^ \^ \^ Y^ O^ _O^ [ R^ \^ O^ S^ Z^ M^ O^ e^ i [ Y^ M^ c^ M^ U^ Z^ S^ Y [ ^ O^ U^ Z^ R^ \^ Y^ M^ U^ J^ Z^ M^ U^ a^ O^ M^ O^ \^ O^ O^ Z^ U^ S^ _T [ a^ P^ N^ O^ S^ U^ O^ Z^ \^ T^ O^ [ \^ \^ \^ a^ Z^ U^ e^ [ T^ M^ O^ M^ Y [ ^ O^ P^ O^ M^ O^ P^ P^ U^ O^ _U^ J^ Z^ M^ U^ a^ O^ M^ O^ \^ O^ O^ Z^ U^ S^ c^ U^ T^ M^ U^ Z^ R^ \^ Y^ O^ P^ O^ Z^ O^ U^ M^ Zž^ F^ T^ O^ N^ O^ Z^ O^ R^ U^ _M^ Z^ P^ X^ Y^ U^ M^ U^ J^ Z _ [ R^ Q^ _U^ S^ i^ M^ Z^ P^ M^ e^ M^ [ O^ M^ O^ P^ Q^ _ _ _T [ a^ P^ N^ O^ P^ U^ O^ _O^ Pž	5 [ Z _O^ _a_ Ž^ N^ M^ O^ P^ \^ O^ Q^ Y^ Y^ O^ Z^ P^ M^ U^ J^ Z
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3X^ \^ O^ S^ Z^ M^ \^ c [ Y^ O^ Z^ _T [ a^ P^ N^ O^ [ R^ R^ O^ P^ N^ M^ O^ \^ O^ O^ Z^ U^ S^ R^ \^ T^ M^ M^ O^ Y^ U^ M^ O^ M^ O^ \^ M^ a^ _N^ e^ M^ R^ X^ N^ X^ [ P^ O^ i^ V^ U^ Z^ M^ U^ J^ Z^ M^ U^ Z^ U^ U^ X^ \^ O^ _O^ \^ M^ U^ J^ Zž^ E^ O^ O^ Z^ U^ S^ c^ U^ T^ _\^ O^ O^ U^ O^ M^ _M^ _R^ \^ T^ M^ O^ Y [ S^ X^ N^ U^ Z [ \^ M^ T^ O^ /_a^ O^ f^ M^ : B>5 [ ^ 7B9 M^ Z^ P^ T^ M^ O^ Y [ S^ X^ N^ U^ Z [ \^ M^ T^ e^ S^ O^ Z^ O^ 6@3^ \^ Q^ _U^ S^ f^ i^ T [ a^ P^ N^ O^ Q^ Z^ _U^ P^ O^ P^ U^ Z^ T^ I^ S^ T^ \^ U^ W^ O^ T^ Z^ I^ O^ [ \^ \^ [ \^ a^ X^ M^ U^ J^ Z^ S^ \^ a^ \^ ž	9^ M^ P^ O^ 5

Ž/ , JTDVTTJPO BOE SFDPN N FOE BUJ POT

FTQRĚ Ěc UZS \_OOŮ Z Qa NMP \_[ Z QMOT 'OO Y Y OZPMUJ Z \_aY Y MUOP QMXXŽ

ŽĚ 8SF OBLUMFTUT ĞPSD SPN PTPN F BOFVQVĚJFT

8SF OBLUMFTUT ĞPSD SPN PTPN F BOFVQVĚJFT	
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3XX \ 'OSZNI` c [ Y OZ _T[ aXP NO\ \ bUPCP c UT UZĚ Y MUJ Z NIP TMBO `Ů Qe MODO _[ _O'OOZ UZS` Q` _RĚ ^RO NMO' Y [ _] Y QMIP SOZO WD Q ZPUUJ Z ž B' OZMINX O'OOZ UZS [ \ Ů Z _T[ aXP NO PUGa _OP NIP [ RRO'OP UZ `TORU` `Ů Q` Q` c TOZ QbQ` \ [ _UNOŽ	> QbQ; ; Ž% 9 ^NPO5 &

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- %##ž# 3XX \ 'OSZNI` c [ Y OZ \_T[ aXP NO NMP bUPCP [ R' TON NBNK NUXe [ RUZ bQ` LSMUJ Z \_RĚ ^\ 'OZMINX NIP  
 PUISZ [ \_U M QMĚ M \ [ \_UNO UZ \ 'OSZNI Qe` [ NĚ c `Ů Q` [ PUGa \_TO [ \ Ů Z \_NBNK NBNONIP  
 RMOXIMOMZ UZĚ Y OP OT [ WOX 3Z UZĚ Y OP OT [ WOU dNMCP [ Z 'OObNI` VZ [ c XPSQ Q Z \_U` OZ`  
 c UT `TOPCOUJ Z Y MWOĥ bNĚ Q pž
- %##ž\$ FTQ [ RRO' [ R O'OOZ UZS \_T[ aXP NOY NPO` [ NĚ Q \ \ OU` Q` \ COU WQ [ R' TOOX Z OUMĥ \ O'OO \ Ů Z [ R  
 c TM` TQb XVQe OT [ WOU Y IST` NOZ;` \_U Q` OZ` UĚ TM` TOc [ Y NĚ U Z [ ` P O\ WCP [ R' TO  
 [ \ \ [ ^aZUe [ RZP [ a` M [ a` `TQTQXT [ RTO'RO a ž;` \_U Z [ ` Q T O N K [ \ ` Q a \ \ [ \_Q M Q a ^ Q [ R  
 N O U J Z \ \ Ů ^ [ ` T U U Z Ě Y M U J Z N O U Z S \ \ Ů b U P C P ž
- %##ž% E [ Y Qc [ Y OZ Y MĚ Y MWOZ UZĚ Y OP COUJ Z Z [ ` ` [ \ Ů ] OOP c UT MĚ ` Q` UZS ž 5 [ aZ OXZS  
 \_T[ aXP RĚ Ěc M TMCP COUJ Z Ž Y M W S Y [ POK c TO'OTQXT \ Ů RO \_U Z NĚ PUGa \_UZĚ Y MUJ Z  
 NMCP [ Z `TQb Qd O` UQNZP `Q` \ CO RĚ ^` TOc [ Y NĚ ĥ bNĚ Q UZ M' WUZS M NĚ NŠ` OOP Q a ^ Q [ R  
 N O U J Z ž
- %##ž& ;ZĚ Y MUJ Z \_T[ aXP NO Q Y Y aZUWCP a UZS OOMĚ Ů \ \ O NIP Q Z \_U` OZ` XN SaMSQc TOZ  
 PUGa \_UZS UZ bQ` LSMUJ Z } c UT Q Z R Y MUJ Z ` TM` TO UZĚ Y MUJ Z TM NCOZ aZPO` \_ [ [ P NIP c UT  
 ` TM a Z P O` \_ NIP U S P [ Q a Y OZ` OP ž
- %##ž' ;ZĚ Y MUJ Z \_T[ aXP NO \ \ bUPCP UZ MĚ Y M` TM U Q M e` [ aZPO` \_NIP NIP MODO UNO` [  
 \ 'OSZNI` c [ Y OZ R [ Y Qa Xa` NĚ NIP XZ SaU` WĚ PibO` Q NMOŠ [ aZP \_UZOa PUS; ZPUSOZ [ a\_  
 c [ Y OZ f i NIP c [ Y OZ c UT NPPUJ Z N X Z O P / a O T M \ Te W N K \_ O Z [ ` e [ ^ X M Z U Z P U R O a X I O f ž 3 Z  
 UZ` O` \ OZS O` b W O \_ T [ aXP NOY NPO NBNK NUXe TO'OU U` Q] aUCP / CO [3 \ \ OZ P d i 7 f ž](#)
- %##ž( ;ZĚ Y MUJ Z \_T[ aXP UZOaPO` TORĚ Ěc UZS.  
 NĚ 3 P Q O` Ů \ Ů Z [ R' TO Q Z P U U J Z \_` T M O M NIP O N I Z [ ` N O P Q O O P ` T Ů a S T ` N P U U J Z N K  
 \_O'OOZ UZS \ Ů O O \_ Q NIP P Q N K [ R' TO` Q` UZS \ Ů O O ž FTU \_T[ aXP UZOaPO UZĚ Y MUJ Z  
 M N [ a` \ T O Z [ ` e \ W b M U M U X e [ R O T Ů Y [ \_] Y N O Q Z P U U J Z \_ N I P ` T O P U R O a X I O U Z N O U Z S  
 M N O ` [ \ ` O P W ` T O Q d ` O Z ` [ R O R R O [ Z M M' W a X M N M e ž  
 Nž 3 PUGa \_UJ Z [ R' TO P U R O ' O Z O O \_ N O c O O Z \_O'OOZ UZS NIP PUISZ [ \_` W` Q` ž  
 Qž 3 P b NĚ NŠQ NIP P U N P b NĚ NŠQ [ R' TO P U R O ' O Z ` e \ Q [ R' Q` \_ NBNK NBNONIP / M W S U Z [  
 M O Q a Z ` T O S O \_ M U J Z [ R' T O \ ' O S Z N I Q e f ž  
 Pž B` W O W N M \ CO \_ [ R' Q` UZS / UZOa PUS ` TO' Ů UZS [ R' Q` \_ NIP ` T O M \ Ů d Y M O Q ` \_`  
 UZ b [ X C P ž  
 Qž FTQ \ [ \_UNOXe` TM` TO` O'OOZ UZS NIP PUISZ [ \_` W` M T c MĚ Y MĚ ` Q b Q M N [ Y N O \_ [ ` T O`  
 ` T M ` T [ \_ Q Q N C O P ž  
 Rž 6 Q M K [ R a \ \ [ ^ S [ a \ \_ NIP \_] a` O O [ R R a` T O` U Z Ě Y M U J Z / CO : [ c \_] P C O U P O [ Z  
[NĚ OZMINX Q` RĚ ^ O T Ů Y \[ \\_\] Y NBNK \[ Y M O W NIP \[ ` T O` Q Z P U U J Z \\_ NIP 3 Z` OZMINX  
 \\_O'OOZ UZS RĚ ^ 6 \[ c Z e Z P Ů Y O M I P \[ ` T O` Q Z P U U J Z / @ Q : L O N N I P ž](#)

Sz FTOaZPO^\_MIPUS`TMI URMOT`Y [ \_]Y Q[ ^SOZQWDQ ZPUUJ Z U\_PUUSZ[ \_CP Me [ Y MZ  
 ONZ OT[ [ \_Qc TQTQ^` Q Z`LzaQ[ ^`OY LZMO`TQ\`OSZMZGeZ! TOQMOQ ZPUUJ Z TM  
 NCOZ PUUSZ[ \_CP \MOZ`\_T[ aX NOSUBOZ\_aRROOZ`UZR`Y MIUJ Z`OSMPUS`TOMU`X Set  
 M[ OUMUJ Z`MIP U`XOMUJ Z`[ R`TMPUSZ[ \_U Pa`US\`OSZMZGe`TOZQc N[ `Z \O`U P  
 MIP NGe[ ZPI LZ [ `PO^` Y MZOZR`Y CP PCOUUJ Z`MM a`TQJ[\`UJ Z`z  
 %##Z FTO`T[ aX NOMZ M\_a`MZOO`TM`OSMPXO`[ R`TQJ`PCOUUJ Z`c [ Y OZ c U`XNO[ RRO`P  
 Q`aZ`OXZS MIP`OCCUBO[ ZS[ LZS OMOMIP\_a`\`^z;Z`TQOMQ[ RQ Z`LzaUS`TO\`OSZMZGe  
 c [ Y OZ MIP`TQJ`M`ZO^`\_T[ aX NO\`[ bUPC c UT M\`[ \`UMONZ`OZMN`XOMO c UT  
 LZPUBPaM`XCP \`O`MMUJ Z`R`^N\`T MIP ZQ ZMNXY MZSOY OZ`zFTO[\`UJ Z [ RZQ ZMIX  
 \`XOMUBOQMO`T[ aX NOPUGa`CP R`^Q ZPUUJ Z`c TO`O`TO\`SZ[ \_U U\`[ [ ^MIP \`XOMUJ Z U  
 M`ONX`UO[\`UJ Zz;R`TQe OT[ [ \_Q`OY LZMUJ Z`TQe ZCOO`[ VZ[ c`TM`TOY [ PQ[ R`OY LZMUJ Z  
 Y M`NOUZRa`OZCOO Ne SQ`MUJ ZMN`SOUZ XZQc UT E`MO`X`z`

**ZÁ 8SFOBUBMDSFFOJCHUFTUJ QPSGFUBMŠ SPN PTPN F BOE HF OF UDDPOEJUJ POT**

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EO`OOZUS [ ^PUUSZ[ _`UO`Q`LZSR`^RO`N`OT`Y [ _]Y M`MIP SOZQWD Q ZPUUJ Z`U`b[ XaZ`Me MIP`_T[ aX [ Z`e NOaZPO^`MVOZ M`M`UZR`Y CP PCOUUJ Z`Ne`TO\`OSZMZ`c [ Y MZ`z`	5[ Z`OZ_a`ZNMCP `OQ`Y Y OZPMUJ Z`
: FDPN N FOE BUJO Ž	/ SBEF BOE TVCOPSJCH SFGSFOFT
;RM`O`OOZUS`Q`:`Q`aX LZPUBO`M`UZ`O`Q`MCP OTM`OO[ R`MOT`Y [ _]Y Q [ ^SOZQWDQ ZPUUJ Z`TQc [ Y MZ`_T[ aX`TNBOMOO`_`[ SOZQWD Q`aZ`OXZSR`^Ra`^TO`UZR`Y MIUJ Z`MIP_a`\`^z` FTON`M`M`MO[\`UJ Z`R`^`\`OZMN`X`PUUSZ[ _U`_T[ aX`NOPUGa`_`CP MIP [ RRO`P`z`	5[ Z`OZ_a`ZNMCP `OQ`Y Y OZPMUJ Z`
: FDPN N FOE BUJO ž	/ SBEF BOE TVCOPSJCH SFGSFOFT
3OOO`M`MOR`_`Z`ZO`O`OOZUS`Q``R`^RO`M`OT`Y [ _]Y Q`MIZ[ `Y M`UO` LZ`TOR`_`^Y`Q`O`LZO`a`POCJTQ` M`IQ`Y`MIZ`OP`R`_`^Y`Q`O`O`OOZUS`c`UT`Za`OT`M`^M`_`Xa`OOZ`e`MIP`O`aY \`OSZMZGe`M`[ OUMCP \`X`Y`M`^`OZ`3/B3BBŽ`f`MIP`NO`M`f`aY`M` OT[ `UJ Z`OS[ Z`MIP[ `^[\`L`/ : 59f`iy`Q`M`a`OY`OZ`_` AD` @3/OR6@3f`ZNMCP`O`OOZUS`z` RR`_`XZO`O`OOZUS`Q``c`X`PO`OZP [ Z`X`O`M`O`[ a`OQ`f` [ S`M`T`UO`f`MIP`LZPUBPaM`X`M`UOZ`OT`M`M`O`Q`U`UO`z`	5[ Z`OZ_a`ZNMCP `OQ`Y Y OZPMUJ Z`
: FDPN N FOE BUJO!	/ SBEF BOE TVCOPSJCH SFGSFOFT
B`OZ`Q``Q`aZ`OXZSR`^OR6@3`ZNMCP`O`OOZUS`_T[ aX LZO`a`POUZR`Y CP PCOUUJ Z`Y`M`VZS`OSMPUS`Q`LZSR`^RO`N`O`MIP`O`OT`Y [ _]Y Q MZOa`X`U`Pe`z`FTO[\`OZ`U`X`R`^`[ `TO`a`ZM`UO`MCP`RZ`PUS`_`[ R`O`O`b`M`OO`[ Y`MO`Z`N`X`T`O`N`X`T`LZO`a`PUS`Y`MO`Z`M`SOZ[ Y`UO`Y`N`X`M`OO`f`_T[ aX`NO LZO`a`POUZ`^`OZ`Q``Q`aZ`OXZS`z`	5[ Z`OZ_a`ZNMCP `OQ`Y Y OZPMUJ Z`



3X\ 'OZMNX\_O'OOZUS 'Q\_aX\_\_T[ aXP NOQ Y Y aZ\OMCP` [ `TO'OR'MUSP[ O[ ^MIP\MIOZ` M\_] [ Z M  
 \[\_UNQMP U MY MZO` TMOZ\_a'Q\_OQMaZPO`\_MIPUSZFTOMDQ Z` [ NO`MVOZ [ Z`TONMU [ R  
 MIZ[ 'Y NX'Q\_aX\_U MPCOUQ Z R` ^`TOQ a\XQZ ZOOZCP NMCP [ Z`TOUZR` 'Y MIQ Z SUBOZ c UT PaX  
 Q aZ\_OXZS\_a\ \[^z

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Uf15[ Y NUZCP RY` ` 'Y Q`Q`\_O'OOZUS/58FEfIU \O'R` 'Y QP M##L" ` [ #%&( c OQVNe UZQ ^ [ 'MIUS  
 Y MOZMNSQ aX'M[ aZPY QMa'QY OZ` [ RRO'NZaOTM` 'M\_XaOOZOb MIPY MOZM\_Q'aY Y MVO`\_ [   
 SQO'MQNZ [ bO'NKOTMCO [ R` 'U[ Y e \$#z5McaXMIQ Z\_R` ^` 'U[ Y e #%MIP #+ MQNX [ UZQ ^ [ 'MCP UZ` [   
 `TORJ` ` 'Y Q`Q`\_O'Q` Y NUZCP \_O'OOZUS MS [ 'UTY ž58FE U` TO`\_MIPMP [ ROMOUZ Y [ \_ PCbOX \CP  
 Q aZ` 'UQ PaQ` [ U\_PaM'NPbM` NSQ\_ [ RTIST \_OZ\_UbUJe MIP QM% PQ OOUQ ZžFTO'QMOMX [ `TO  
 NPPUQ ZM'NPbM` NSQ\_ [ RM[ a`UZQaX'M[ aZP QdMY UZMIQ Z M##L" k #%&( c OQV UZO&PUZS  
 Q ZRY MIQ Z [ RRO'NZaY NO' SQ` MIQ Z bUMUJe MIP \_`aOa'XPcOX \Y OZ` ž

Uf15OXZR'OO6@3/0R6@3fižNMCP\_O'OOZUS a\_UZSY MOZMNXMY MONZ NO\O'R` 'Y QP 'OXUMe R[ Y #"  
 c OQVžFTU \_O'OOZUS`Q` NCOM Qc UPOe NBNXNDQZ 3a` 'VMZ \$" #%MIP TM`TOTISTQ` \_OZ\_UbUJe



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TNBQ\_aRR00Z` PUSZ [ \_l0M0Ca`M0e` [ '0\XMOUZbMlbbQ`Q\_ 'UZS/0Z`RXQ\ [ \_UlBQNZP`RXQ`OZOSMlbbQ\_`UX  
[ COa`fz;` c M\_LZUuX6 bNXPMPCP MZP`0QZ`0W6e LY \XOY OZ` CP`M`M` dN'PbM'00Pp [ ^\_0Q` ZPMe\_0'00ZUS`Q`  
R`^c [ Y OZ` M\_LZ0'0MCP`XV0XT [ [ P [ RTNBZS`MOTUP`c`UT` MZCa\X] UPeNMCP [ Z`Y` MOZNMNSQ` \`U] ^  
MNZ [ 'Y` MX\_0'00ZUS` 'Q`aX] aX`M] aZP`U`0SaXMuE [ ^`U] ^TU] [ `e [ RNZCa\X] UPež 6MIMMOZ [ c` N0N0MNDQ  
[ Z`U\_a\_QUZ`TOSQO`M\ [ \aXMu] Z] \_aSSQ\_ 'UZS`Q] aM'Q` \`O'R` 'Y` MZ00OTMND`O`U`\_l0`\_0Z`\_UlB0e  
NZP`\_ \COBR0U`efiNa` M] c` O`OT`M`00 [ RNZ` M'00`CP`R0\_a`\_SUBOZ` MZ` MNZ [ 'Y` MX\_0'00ZUS` 'Q`aX  
/M\`Y` dY` MO6 & ` f' M] c [ aX` NQ`0d\00`CP`R] Y` U\_a\_QUZ` X] c` Q` \`Cb`XOZ`00\ [ \aXMu] Z` ž`!#`!\$#  
6U8SZ [ \_l0`Q`\_UZS`c`UT` M' ZU] 00Z`Q`U] [ ^OT [ 'U] Zl0bU6`\_M' \XZS`\_T] aX` NQ`0d`Y` Y` OZ`PCP` \`U] ^` [  
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I [ Y OZ`\_T] aX` M] [ NQM` M0` TMND`c`00Z`#` [ ( [ R0R6@3`Q`\_`M0aZ`'0\ [ ^MNDZ`\$! [ Y OZ`c`UT  
\_aOT` MbZ [ 0N]6` 'Q`aX` M\`QM` [ TNBQMTISTO`^M0 [ R0R0NMNZ [ 'Y` MZU0`/0Sž` 'UX] UPeff`\$%` MZP`TO`Q`R` 'O  
\_T] aX` TNBQ`R` X] c` a\ M\_Q`\_Y` OZ`\_UZ06`PUZS`PQ`M0CP`aX`M] aZP`URZ [ `M'0N'Pe` \`O'R` 'Y` CP`fz`FTQe`\_T] aX`  
NQ [ R0'0P`TO`N0N0MNDQ [ \`U] Z`\_ [ RPU8SZ [ \_l0`Q`\_UZS] '0\`QM`0R6@3`Q`\_UZS/\_a000`\_RaxUZ` M\`Y` dY` MO6  
'`" ` fi [ ^M` M'XOZMlbbQ`R` 'Y` [ R\_0'00ZUS`\_aOT` M] Q`Y` NIZ`CP`R0`\_` 'Y` Q`\_O`\_0'00ZUSž

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'`U] Y` l0`\_`\$#`#`+` MZP`#%ž`FTO`Q`TM] T [ c` Cb0Y` N00Z`Z [ \`000P0Z` R` ^\ [ \aXMu] Z`\_0'00ZUS`R` ^`\_0d  
OT`Y [ \_] Y` Q`Q` ZPU] Z`\_PaQ` [ `TQ`bMUMNDQ`MzP`\_a\_a`M]6`Y` UP` \TOZ [ `e\`0Z`0R6@3`NMCP\_0'00ZUS`R` ^`  
\_0dOT`Y [ \_] Y` Q`\_U`M] [ X0`\_M0Ca`M0`TM`R` ^`TOMa` [ \_] Y` Q] lZ0'0M0`\_TORXQ\ [ \_UlBQ`M0G` MZP`ONZ  
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Y [ \_NDU] Y` MZP`Q` ZRZ`CP` \XMOZ` MXY [ \_NDU] Y` fž`\$&` B`Ož`Q`\_` Q` aZ`\_OXZS`R` ^`0R6@3\_0'00ZUS`\_T] aX` lZ06`PO  
UZ`R` 'Y` CP`PC0U] Z` Y` MNZS`'OSM'PUZS`\_Q`\_UZS`R` ^`R0`M'QdMzP`\_0dOT`Y [ \_] Y` QMZCa\X] UPež! [ Y` OZ`

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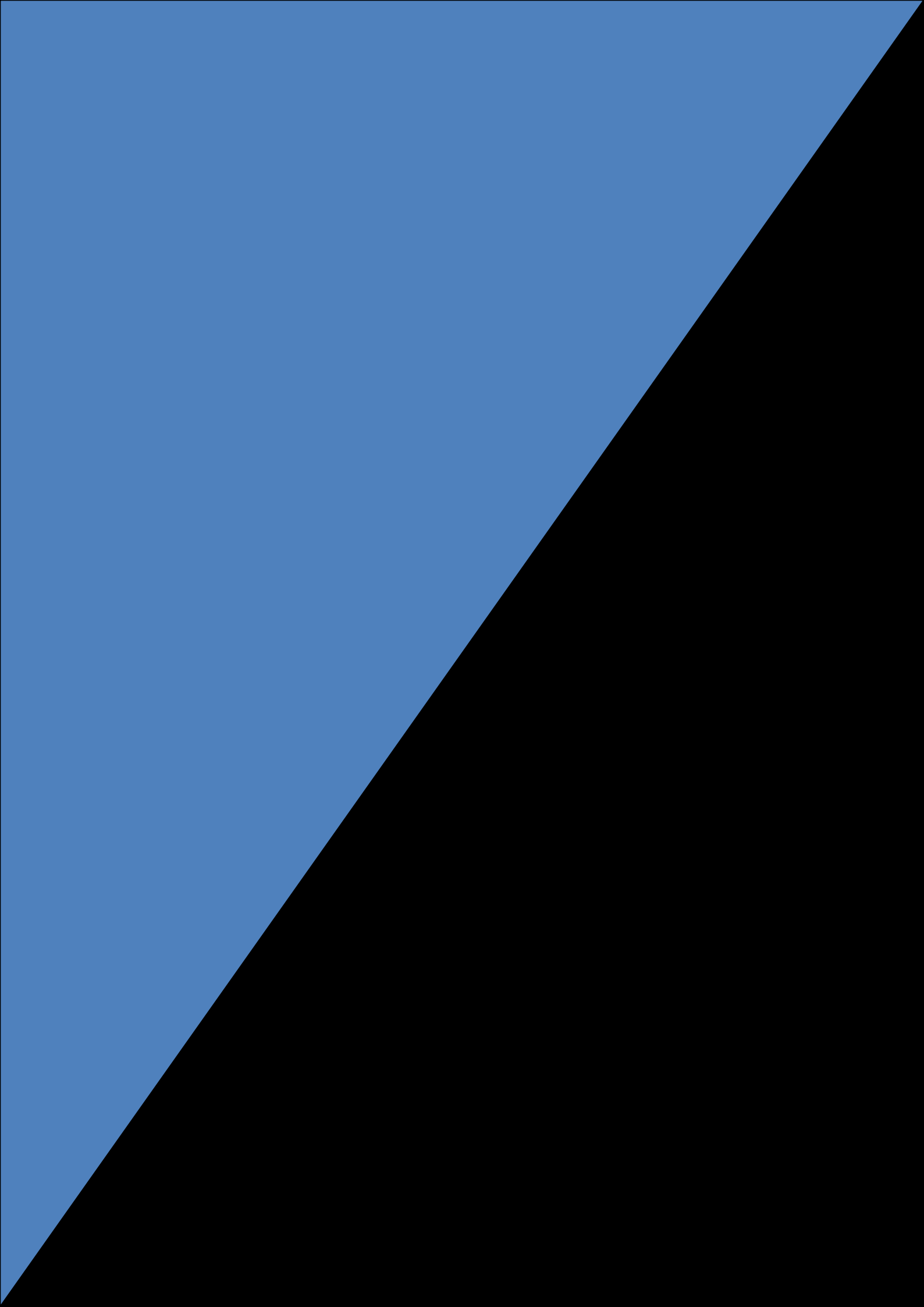
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8[ ^NXY aXUXQ \^OSZM000+ R0_` ^Y Q_ Q^aX^M[ aZPM_Q_Y OZ` [ R OT[ ^U ZW0e M P R0 NXY [ ^T[ X Se M ##ž#%c 00W_U ^00 Y Y OZPOP R ^N c [ Y OZ R ^Z` Q^ \^O M U Z [ R_0'OOZUS ^Q_aX_ M P ^W\$US` [ M \^ \^WMO Y [ POX [ RM ^OZMVMQMG ^OSMPX_Q_ [ R TQOT [ WQ [ ROT ^Y [ _] Y Q _0'OOZUS `Q_ ž	5[ Z_OZ_a žNMOP ^00 Y Y OZPMU Z
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[ ^ T Q ^ \ T e \_ W X O T M M O Q U \_ W \_ M Q b U a M X M \_ Q \_ Q P N e M O e ` [ S O Z O W U ` ž ; ` U P O Z ` W R O \_ O T M S O \_ U Z  
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3.5.1 Population-based reproductive carrier screening

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/ PPE OSBJUDF OPUF	/ SBFE BOE TVOOPSIJCH SFQSFODFT
B'OCQ ZOCAN'UJ Z _O'OOZUZS U \^OCOMNDQ [ M' OZMINX O'OOZUZS R ^ TOUMNDQSOZO WOC ZPUUJ Z _M' TU \ [ ^OZ' UWXE NXX c _Y [ ^O [ \^UJ Z _R ^ OMM'W^C a \XQ _J UZOaPUZS \^OZY \XZ' MIUJ Z SOZO WOPUSZ [ _Uz	9 [ [ P \^MOWOZ [ ^Q /C Z _OZ_a ŽNMOPfi
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3XXC a \XQ _J ^OZPUZS \ [ TMOOTUP^OZ [ ^c T [ MOV^OSZM' t _T [ aX TMO MOCRaXRY Ue TU [ ^e ^MVOZ c UT MblOc \ [ UPOZ' UReUZS ^OXMUBQ_c UT TOUMNDQSOZO WOPU [ ^PO^ ŽFT [ _Q UPOZ' UROP c UT MRY Ue TU [ ^e [ RM _\COBUDZTO'UCP PU [ ^PO^ _T [ aX NO [ RRO'CP ^OCOMNX [ MSZO W Q aZ OXZS _O'blOQ R ^UZ R ^Y MIUJ Z MN [ a' OMM'W^ _O'OOZUZS NZP \^OZMINX PUSZ [ _U [ \^OZY \XZ' MIUJ Z SOZO WOPUSZ [ _U R ^ TOQ ZPUUJ Zz	5 [ Z _OZ_a ŽNMOP ^OC Y Y OZPMUJ Z
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5MM'W^ _O'OOZUZS R ^ TOY [ ^OC Y Y [ Z oY [ Z [ SOZ Wp SOZO WOC ZPUUJ Z _ /OSzGe _\WRM [ _U [ \ZIMY a CaXM M' \Tel RNSUQJ _eZP^ Y Q TMOY NSX NIZ [ \MTW_fiU MNXNDQZ 3a_ ^VMNZP U @C LONXZP /U ^TO \^UMIO _CO [ ^z: ZR ^Y MIUJ Z [ Z OMM'W^ _O'OOZUZS R ^ TOY [ ^OC Y Y [ Z SOZO WOC ZPUUJ Z _ TMNROO OTUP^OZ /OSzGe _\WRM [ _U [ \ZIMY a CaXM M' \Tel RNSUQJ _eZP^ Y Qfi _T [ aX NO [ RRO'CP \ NXC [ Y OZ \XZUZS M \^OSZM'Ge [ ^Z _TORJ _ ^Y Q _Q [ R \^OSZM'Gez [ [ Y M c M' UZSY [ ^O UZ R ^Y MIUJ Z MN [ a' OMM'W^ _O'OOZUZS _T [ aX NOSUBOZ ^TO [ \ [ ^aZUe [ TMOY [ ^OPO NXP PUca _UJ Z MN [ a' OMM'W^ _O'OOZUZS c UT M UZ R ^Y CP OZ WOX ŽFTONOCRU _M P XY UMUJ Z _ [ R' Q _UZSI NZP M e M [ OMM'W^ Q _ _T [ aX NQPUca _OPz	5 [ Z _OZ_a ŽNMOP ^OC Y Y OZPMUJ Z
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3X \^OSZM' c [ Y OZ _T [ aX NO [ RRO'CP NM'W^ _O'OOZUZS R ^ TM' M OY UM OMM'W^ _Ma _Ne M RaXNX [ P CaMY UZ MIUJ Z M UZ UWX ^O OZ ^ MIUJ Zz EO'OOZUZS c UT _\COBUDZTO'UMNDQ PU [ ^POz; ^ P [ Q _Z [ ^OCR^ [ ^Q _UZS M UZ P U PaNX c UT M _^ ZSRMY Ue TU [ ^e [ RMZ [ c Z [ ^ [ _\WDSOZO WOC ZPUUJ Z k ^TOQ \Q \XQ _T [ aX NO [ RRO'CP PU CO ^OCOMNX [ M \COXU OZ WOX SOZO WOC _O'blOZ	9 ^MPO5

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; U\_Q^LY MQP`TMNKLZPUBPaM\MQOMW^R^M^XQM^T^OOOZLW^CbO^O^OOO`\_bOQ^UPT[ [ P  
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Y^a^M^U^Z^Z^ [ Z^O^S^O^Q^Q^ \e [ R^M^ \CO^P^O^S^O^Q^ \M^N^ M^P^URN^T^ \M^ [ Z^T^O^Y^a^M^U^Z^T^T^O^ [ R^ \^Z^S^c^U^X  
P^C^O^X^ \ M^Y^O^P^L^O^N^ \S^Z^U^R^O^N^ \S^O^Z^O^W^Q^Z^P^U^J^Z^Z^ \Z^Z^V^Z^P^ \^O^O^O^ \b^O^Q^Z^P^U^J^Z^ [ O^C^a^c^T^O^Z^M^c^ [ Y^M^  
O^M^W^M^Y^a^M^U^Z^Z^ \M^S^O^Q^ [ Z^T^O^J^Z^O^T^Y^ [ \_Y^O^Z^;R^T^Q^ \M^Q^T^U^Y^a^M^U^Z^Z^ [ T^O^ [ Z^T^O^c^U^X  
P^C^O^X^ \ M^Y^O^P^L^O^N^ \S^Z^U^R^O^N^ \S^O^Z^O^W^Q^Z^P^U^J^Z^Z^

FTOQOMW^R^Q^aOZ^e [ R^O^O^N^M^Z^ \^O^O^O^ \b^O^Q^Z^P^U^J^Z^\_U^T^I^S^T^O^U^Z^ \CO^P^O^O^T^Z^W^ \ \a^X^M^U^Z^\_O^S^Z^e^\_W  
R^M^ [ \_U^Z^ @ [ ^T^O^Z^7a^ [ \CO^N^ \M^P^3^\_T^V^O^Z^M^U^O^c^ / ^T^M^M^O^Y^U^M^T^M^O^Y^ [ S^X^N^Z^ [ \M^T^W^U^Z^E [ a^T^Z^M^  
3^\_U^Z^\_ /M^P^F^M^Z^E^M^O^T^\_P^U^Q^M^Q^U^Z^3^\_T^V^O^Z^M^U^O^c^\_Z^

3ZaY^NO^ [ R^O^M^W^ \^O^O^O^Z^S^ \^O^\_ \C^U^ c^U^T^U^Z^3a^ \^M^M^U^M^ \^M^O^ \^O^M^P^U^e^M^O^O^ \U^W^Q^R^ [ Y^ [ b^O^ \^O^M^f^i^N^a^  
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;Z^R^ \^Y^M^U^J^Z^ [ Z^O^M^W^ \^O^O^O^Z^S^ \^R^ \^T^O^Y^ [ \^O^Q^Y^Y^ [ Z^S^O^Z^O^W^Q^Z^P^U^J^Z^\_T^M^N^R^O^O^T^U^P^ \^O^Z^ \^O^S^Z^  
e^\_W^O^R^N^ [ \_U^ [ \_U^Z^N^X^Y^a^G^a^X^M^M^ [ \T^e^f^R^N^S^U^O^J^\_e^Z^P^ [ Y^G^f^T^ [ a^X^N^O^ [ R^R^O^P^ [ M^X^c^ [ Y^O^Z^ \^X^Z^Z^S^M  
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c^U^T^M^ \^U^R^ \^Y^O^P^O^X^Z^O^M^Z^ \^F^T^O^N^O^Z^O^R^\_M^P^X^Y^U^M^U^J^Z^ [ R^ \^O^ \^U^S^I^M^P^M^e^M^ [ O^M^O^P^Q^\_ [T^ [ a^X^N^O^  
P^U^C^a^\_O^P^z^

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R^M^ [ ^\_ [ Q^Z^\_U^P^O^c^T^O^Z^P^C^O^P^U^Z^S^N^O^c^O^O^ [ Z^O^Z^ \^O^ [ ^c^ [ Z^ \^O^ \^O^M^W^ \^O^O^O^Z^S^z^

I^U^T^T^O^U^Z^ \^Y^P^a^O^U^J^Z^ [ R^Z^O^c^S^O^Z^ [ Y^W^O^Q^]a^O^Z^O^Z^S^ \^O^O^Z^U^]a^O^}O^M^W^ \^O^O^O^Z^S^ \^R^ \^M^Y^a^X^U^a^P^O^ [ R  
 \^O^O^O^ \b^O^Q^Z^P^U^J^Z^\_U^Z^ [ c^M^N^O^M^O^R^ \^Q^a^ \^X^c^T^ [ T^M^O^Z^ [ R^M^U^e^T^U^ [ ^e^ [ R^M^S^O^Z^O^W^P^U^] \^P^O^Z^#^F^T^U  
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 \^M^T^c^M^\_R^ \^ \^O^Z^M^P^ \ [ \_Z^O^ \^S^O^Z^O^W^Q^a^Z^O^X^Z^S^I^M^a^ \ [ \$&^ [ R^M^P^a^X^\_c^U^X^Q^\_ \ [ \_U^W^O^R^ \^M^X^O^M^  
 [ Z^O^ \^O^O^ \b^O^P^U^] \^P^O^Z^\$^

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\_O^OZLZSNZP i f'ž SOZQ\_Q] aOZOZSR^R^NMOOT[ SOZLON[ c OX fE fE SOZQ\_Q] aOZOZSR^ \[\_UNQ0R^N  
MOT[ ZP^ \XMMUM[ ^O^MZU\_eZ[\_[\_U^M^P`MSOCP`Q`LZSR^ ^Y a`MIJ Z\_UZ SOZQ\_OVA\_LZS@[ [ ZM  
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I UT`TOUZ`^ [PaOU] Z [RZQ: SOZ[Y W\_Q] aOZOZS`OOTZU] aQ} U U\_MZ`WXMCP`TM \^OZMINXPUSZ[\_U  
R^ ^Y a`MIJ Z\_UZ Y aXUXOSOZQ\_c U^NQY [ ^Q^QMPUX

## 4. Governance

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Qf O^ZM] aNDeM a^NZODMWBUDž

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E NZPMP\_MQNMCP [ Z`TQ UZ^OZMU ZNX NZPMP;EA # #+- E NZPMP R ħ? OPLOM^MM [ ^M [ ^Q\_ž  
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[ Z`TQDCSU`Q^f R300^CPUCP E[ Z[ S'MTQ^\_TOP Ne? CPWMO3a\_`^MUM8[ ^Ra^TQ^UZf' Y MIj Zf  
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F^M\_xaOOZQe AZXZQ>QVZ UZS B^f S'MY /@FA>Bfi

## 5. References

1.



26. Gross SJ, Stosic M, McDonald-McGinn DM, Bassett AS, Norvez A, Dhamankar R, et al. Clinical experience with single-nucleotide polymorphism-based non-invasive prenatal screening for 22q11.2 deletion syndrome. *Ultrasound Obstet Gynecol.* 2016;47(2):177-83.
27. Pertile MD, Halks-Miller M, Flowers N, Barbacioru C, Kinnings SL, Vavrek D, et al. Rare autosomal trisomies, revealed by maternal plasma DNA sequencing, suggest increased risk of feto-placental disease. *Sci Transl Med.* 2017;9(405).
28. Hui L. Cell-free DNA testing for 22q11.2 deletion syndrome: appraising the viability, effectiveness and appropriateness of screening. *Ultrasound Obstet Gynecol.* 2016;47(2):137-41.
29. Gagnon A, Audibert F. Prenatal screening and diagnosis of aneuploidy in multiple pregnancies. *Best practice & research Clinical obstetrics & gynaecology.* 2014;28(2):285-94.
30. Cleary-Goldman J, Rebarber A, Krantz D, Hallahan T, Saltzman D. First-trimester screening with nasal bone in twins. *Am J Obstet Gynecol.* 2008;199(3):283 e1-3.
31. Tabor A, Alfirevic Z. Update on procedure-

## Ž/ 7U FSTVHFTUFE ŠBEJOH

1. D[eM5[ XCSQ[ RAN\_Q ^WMZ\_MIP 9eZMOC] X SU`\_ž\$"#&ž@[ ZŽZbMlbbQB^OZMVMFQ`UZS R^ ^ 5T^Y [ \_] Y M3NZ[ ^Y Mle a\_UZS? MOZMVBXMY M6@3/EOOZ`URD;Y \M0 BMQ^@[ ž#` fž
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3. 7Pc MP\_ <9† 8OPY M 9† 9[ XNO'S † 9^OSS 3DI @ [ ^ [ Z ? 7† D[ \_Q@5† O Mž 7d\M POP OM^O^ \_O^OZUZS UZ ^O^† PaO lbbQY CPWZOŽ [ UZ \_` [ Q Z\_LPO^: M] UZ` \_MOY OZ` [ R^TO3Y O^WM 5[ XCSQ[ R ? CPWMX9OZQ lbb MIP 9OZ[ Y lbb† 3Y O^WM 5[ XCSQ[ RAN\_Q ^WMZ\_MIP 9eZMOC] X SU`\_† @Ml] ZM E[ ODe [ R9OZQ lbb 5[ aZ\_OX^ \_† BOZMVM CaMle 8[ aZPMl] Z† MIP E[ ODe R^ ^? MOZMVBQ M ? CPWZOŽAN\_Q 9eZOC] X \$"# #/\$ %fi( ' %ž \$ž

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) OCFCEJY . +POEJJPOT c WJ I JH FSQSFVBNVODF JO QFPOVIX JU OBSUDVBSFU QDUZ



) OQFOEJY / , FGOUJIPOT BOE ) CCSFWBUJPO

FTQRĚ Xc ŹS`MNDQPNK`QY`\_NĪPMMN`CbWUŹ\_a\_CP`T`[aST[a``TU`\_`MOY`OZ`žFTQPCRZUŹ`  
TNDQNOZ`MŹR[Y``TQ@WUŹZNX>UN`Me[R? CPWZQ\_? CPWNEaNCO : QNPUZS`/? CE: fiPMVMMQ  
cTQ`QNDNNDŽ

<FSN

, FGOUJPO

) CCSFWBUJPO

+PN CJOFE . JSTU  
<SIN FTUFS; D8FFOJCH

5[ Y NIZCP R^\_`^Y Q`Q^\_O'OOZUS`Q` Uzb[ XQ\_M  
aX^M[ aZP\_OZ MPMN^ [ P`Q` M##Z#%&( c OOW  
\\^OSZMZež

O8FE

	MOTUSTX&bMUMNOŽ	
6FHBJWF 8SFEJUMF >BMF	FTOZOSMlBQ\^OPWlBQbN&OU`TO\^[\ ^U]Z [ RZOSMlBQ ^Q_aX_Ł`Q`_`TM MO`^aOZOSMlBQ^Q_aX_žFTO@BH U_Z[` Ł`^Ł_Ł [ `TO`Q`I U PQ\QZP_MX[ [ Z`TO\^CbMVOZOOž	@BH
6VDI BNBOTMDFODZ	3 \^OZMNXaX^M[ Z[ S^MTeY QMa^OY OZ` [ R`TO_] R`U_aQ NOTUZP`TORO_NXZOOV	@F
7FTUSPM	AZQ[ R`TO`T^OOY MZ Q`^ [ SOZ_ \^ [ PaOOP Ne`TQTaY MZ N[ Pež;` U_MT[ ^Y [ ZOY NPOPa^ŁS \^OSZMZe`TM ONZ NO a_CP` [ Y QMa^OR` Q NKTQVKT MZP \^OPW c TOZ NU^TY M TM \OZž	G7%
8SFHOBODZ BTTPD.BUFE QNBTN B OSPUFJO)	3 \^ [ PaO [ R`TO\XMOZ`MINZP PCOIPaMI`OO^O CP UZ [ `TO Y MO^ZNXOQCaXMIQ Z Pa^ŁS \^OSZMZež	B3BBŽ3
8SFJN QVZUBUPO HFOFUDEJBHOPTJT	6O OY ŁZMIQ Z [ R`TOZMa^O [ RMA MT[ X SLOWXQ ZPUU] Z [ ^ PU_QM_QUŁ`TO[ baY /feS`^O/[ ^NMZ[ Qe_ \^U ^` U \XZ^MIQ Zž;` U_a_CP` [ `Q` OY Nre[_R` ^_\OOBOSZO Q W [ ^OT^Y [ _]Y NNMZ[ ^Y NOLQ_MZP OZMNO_`TO_OOO] Z [ R aZMPOOCP OY Nre[_ \^U ^` [ U \XZ^MIQ Z MZP \^OSZMZež	B96
8PTJUMF 8SFEJUMF >BMF	FTQ\[_UWQ\^OPWlBQbN&OU`TO\^[\ ^U]Z [ R\[_UWQ ^Q_aX_Ł`Q`_`TM MO`^aO\[_UWQ^Q_aX_žFTOBBH U_Z[` Ł`^Ł_Ł [ `TO`Q`I U PQ\QZP_MX[ [ Z`TO	